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THESIS

USING CYBER CAPABILITIES TO INFORM AND INFLUENCE

by

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USING CYBER CAPABILITIES TO INFORM AND INFLUENCE

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ABSTRACT

As the world evolves and becomes more technical, the need for traditional messaging techniques diminishes. The need of the military to be able to dynamically target an individual or group with specific messages in order to inform or influence grows exponentially every year. This need also increases as the United States shifts its military focus from uneducated Third World countries to countries with established infrastructure and large cyber footprints. The military must be able to use the cyber domain to inform or influence a target audience to achieve a desired effect by disseminating a message, attributable or non-attributable, through use of the Web, e-mail or social media. The ability to understand the topology of the Internet is key to targeting a specific audience and to do this an understanding of geolocation is key. To target a specific audience with a message we must understand where they are located to understand culture, customs, and language. With cyberspace quickly becoming a dominant factor in the information environment, how can the military use the cyber domain to inform or influence a target audience to achieve a desired effect by disseminating a message, either attributable or non-attributable through the web, e-mail or social media?

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LIST OF ACRONYMS AND ABBREVIATIONS

PA – Public Affairs

MISO – Military Information Support Operations

PSYOP – Psychological Operations

IIA – Inform and Influence Activities

SNS – Social Networking Services

TA – Target Audience

TAA – Target Audience Analysis

IO – Information Operations

MILDEC – Military Deception

ISP – Internet Service Provider

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I. INTRODUCTION

As the world evolves and becomes more dependent upon cyberspace the need for traditional messaging techniques diminishes. The need of the military to be able to dynamically target an individual or group with specific messages in order to inform or influence grows exponentially every year. This need also increases as the United States shifts its military focus from uneducated third world countries to countries with established infrastructure and large cyber footprints. The military must be able to use the cyber domain to inform or influence a target audience to achieve a desired effect by disseminating a message, attributable or non-attributable, through use of the web, e-mail or social media. The ability to understand the topology of the Internet is key to targeting a specific audience and to do this an understanding of geolocation is key. To target a specific audience with a message we must understand where they are located to understand culture, customs, and language.

Currently the military is conducting Military Information Support to Operations (MISO) and Military Deception (MILDEC) to influence, and Public Affairs (PA) to inform specific target audiences based on the current needs of the command.¹ The majority of the capabilities that are being employed by MISO, MILDEC and PA professionals are based on traditional media, including paper products (leaflets, posters, billboards), television and radio, with little use of the cyber domain. With over 2.2 billion people (and growing) utilizing the Internet to communicate and receive information, the military needs to make greater use of the web, e-mail, Facebook, Twitter, and other online communication systems in order to inform or influence a specific target audience.

In the past decade, millions of dollars has been spent on MISO campaigns that included posters, handbills, billboards, and leaflet drops. MISO has also been used to design radio programs and television shows in an attempt to

¹ MISO is a new term used by the Department of Defense, replacing the term PSYOP or psychological operations.

influence foreign audiences. In specific campaigns, techniques are employed to target specific people or audiences with a message, but the technique normally involves blanketing a large area to influence a small audience.

Public Affairs has been working hard to publicize military actions with both domestic and international news agencies. But again, Public Affairs has concentrated on print media and then radio and television. Public Affairs has an advantage when it comes to using cyber capabilities mainly due to the fact that most international news agencies have an online presence. We will build and expand on this premise to use cyber as an information or influence-based medium. A significant issue that must be considered when employing MISO assets to influence an audience is federal law (1948 Smith-Mundt Act) prohibiting the use of psychological operations to influence American citizens. Understanding how messages and traffic flow from place to place on the Internet is key in the use of cyber capabilities to target an audience and limit that audience to a specific area.

In their 2010 NPS thesis, Downey, Hollis, and Rouse discuss how conventional media distribution techniques employed by MISO are no longer as effective as web based techniques such as e-mail and social network services (SNS). "The effectiveness of SNS seems to be driven by the interactions of individuals, which rally the network or group around an action or an objective. SNS effectiveness is not necessarily about the individuals; it is about what they have in common; and it is about forming a significant relationship with them and actually doing something with it"² (p. 45). The thesis also speaks to the social nature of humans and the ability to rapidly pass information to many people over a short period of time.

Social networking is only one method of using cyber to inform or influence a target audience. Understanding the cyber environment and how information is

² Gabriel R. Downey II, David A. Hollis and Harold D. Rouse, "You Have Been Friendied By the U.S. Military: Using Social Networking Services for IO Messaging," (Master's thesis, Naval Postgraduate School, 2010), 45.

passed through the Internet from person to person and from groups to individuals could be a valuable asset to the military in conducting Information Operations. In this work, we will examine how cyberspace can be used to implement a messaging strategy to either inform a target audience or influence a target audience to do a defined action.

With every information or influence campaign, the hardest aspect of the campaign is defining your target audience and designing a strategy of how best to reach that target audience through the use of different messaging means. We look at different methods to analyze a target audience and then examine different messaging methods within the cyber environment including web page advertising, e-mail campaigns, and the use of social media. In the process, we draw on two case studies. The first involves European Command and the J39 section's efforts to use social networking and Facebook in particular to boost interaction between the command and their target audience in the Balkan region and to boost readership of South Eastern European Times. The second case study involves a mobile phone application development company based in San Francisco, California. This startup company took their first mobile application—an iPhone App—that is targeted at Department of Defense employees and was able to successfully launch the application against their target audience and generate downloads and App usage based solely on a marketing technique that is very similar to how Army MISO teams operate.

Finally we model two different distribution techniques, one that focuses on an e-mail distribution and one that relies on social media to pass a message to the target audience. The key to the models is being able to target the key influencers within the target audience to generate the forwarding traffic that is necessary to be able to resonate to the population. The models show that both e-mail and social networking sites like Facebook are efficient methods of sending information to audiences that have a presence in cyberspace.

The thesis is outlined in the following manner:

Chapter I—Introduction

Chapter II—Target Audience Analysis and Geolocation: Examining ways to identify a specific target audience through the use of the MISO Target Audience Analysis process, webpage content analysis and then finding the physical location of your audience to deliver a targeted message.

Chapter III—Messaging Strategy: Looking at three ways to deliver a targeted message to a specific audience—webpage ads, e-mail delivery, and social media, also examining the effectiveness of a targeted messaging strategy through the use of two case studies.

Chapter IV—Distribution Modeling: Maximizing the distribution of a message in a minimal amount of time, by using a model to predict the spread of a targeted message.

Chapter V—Conclusion: Tying together the use of open-source cyber techniques to inform or influence a specific target audience in the military's newest domain.

II. TARGET AUDIENCE ANALYSIS AND GEOLOCATION

Information Operations (IO) campaigns can be used to inform or influence a specific target audience to assist in achieving a desired effect or commander's end state. In order to utilize the Internet or other cyber capabilities as part of a larger IO campaign there are three things that we must consider. First is Target Audience Analysis (TAA), specifically the people we are trying to reach. Second is location of our target audience, including both physical location and virtual location. And third is the medium we want to use to communicate with our target audience; is cyber the right way to go, or are more traditional means better suited?

To conduct IO as part of a larger operation requires an understanding of the audience that you are trying to communicate with, as well as an understanding of how you want to relay your message. In John Muirhead's article, "The Mind as a Target," he discusses the difficulty in using persuasive communication with different cultures that use different communication techniques; because of these differences, it is difficult to plan MISO operations and measure the effectiveness of the different campaigns.³ To assist with the difficult planning process, the MISO community has developed the TAA process; per Army field manual 3-05.301, Chapter V, target audience analysis is

a detailed, systematic examination of PSYOP-relevant information to select TAs that can accomplish a given SPO [Supporting PSYOP Objectives]. The purpose of TAA is to determine how to persuade one TA [Target Audience] to achieve one SPO. It is not an overview of a TA and will not cover all aspects of the TA. This analysis is extremely precise research designed to determine how to elicit a specific response from a specific TA.⁴

³ John Muirhead, "The Mind as a Target: Psychological Operations and Data Fusion Technology," (Air Intelligence Agency, 2001) 5.

⁴ Department of the Army, *Psychological Operations Tactics, Techniques, and Procedures*, Field Manual 3-05.301, December 2003 (Washington D.C.: GPO, 2003) 5-1.

Within this definition there are two issues; first is the statement that MISO only uses MISO-relevant information to select a target audience. When selecting a target audience all intelligence and information environment factors should be taken into account. MISO should contribute to the overall Intelligence Preparation of the Battlefield (IPB) process that is coordinated and conducted by the unit intelligence staff. The MISO field manual, FM 3–50.30, intelligence support has a whole chapter but begins with; “Although the MISO Intelligence Preparation of the Battlefield (IPB) builds on the IPB of the higher headquarters, it is oriented on the human aspects of the situation and the capabilities of audiences to receive and be influenced by information. The process looks at target audiences within and outside the Area of Responsibility (AOR) that can affect the supported commander’s objectives. MISO IPB is research-intensive and requires that attention be given to areas of the battle space that are not historically considered.”⁵ In today’s information environment the intelligence sections at each echelon weight the human aspect of collection extremely high in all methods of collection and assessment. To make the statement or at least infer that MISO Soldiers are better at human intelligence and evaluating potential target audiences is wrong.

The second issue noted in the above statement is that the TAA is used to persuade one TA to achieve one SPO—In using current distribution methods, radio, television, and print, the message goes out to a mass audience with the hope that the person or group that is the target, will fall somewhere within the group that hears or sees the message. By conducting target audience analysis a message should be designed to not only reach your target audience but also resonate with them.

⁵ Department of the Army, *Psychological Operations Tactics, Techniques, and Procedures*, Field Manual 3–05.301, 8–4.

A. TARGET AUDIENCE ANALYSIS PROCESS

According to FM 3-05.301 the target audience analysis process seeks to answer four basic questions:

- What TAs [Target Audience] will be most effective in accomplishing the desired behavioral or attitudinal response?
- What lines of persuasion will influence the TA to achieve the objective?
- What media will effectively carry the chosen line of persuasion?
- What events will indicate success or failure of the PSYOP effort?”⁶

In an attempt to answer the above four questions and examine information that is relevant to developing MISO courses of action, staffs employ the TAA process. The current MISO TAA process is broken down into ten steps. The first step is developing the problem statement and clearly articulating what the objective or end state / goal(s) are and to shape the entire product development effort.

Step Two of the process is selecting the target audience. The MISO field manual describes techniques of organizing people into groups, categories, or aggregates to further develop the target audiences. As people are divided into groups, they can be further divided into primary and secondary groups. Primary groups are groups of people that share many different relationships or activities such as social groups, families, and groups of friends.⁷ Secondary groups, on the other hand, are associations that form to achieve a goal or purpose; once the goal is achieved the group may disband. Examples of secondary groups are political or legislative bodies, businesses, and non-profit organizations.⁸ Categories are groups of people that share specific demographic traits or characteristic, whereas aggregates define people based on a common geographic area.

⁶ Department of the Army, *Psychological Operations Tactics, Techniques, and Procedures*, Field Manual 3-05.301, 5-1.

⁷ Department of the Army, *Psychological Operations Tactics, Techniques, and Procedures*, Field Manual 3-05.301, 5-2.

⁸ Department of the Army, *Psychological Operations Tactics, Techniques, and Procedures*, Field Manual 3-05.301, 5-3

Two other ways in which to organize people are by centers of gravity or key communicators. Centers of gravity are those individuals or small groups that have a large degree of power over others, and key communicators are individuals within the groups that people turn to for information, opinions, or interpretation of information.⁹

Of the above-mentioned six ways in which to organize people when conducting target audience analysis, the field manual states that using primary, secondary and aggregates are a poor choice based on the fact that these associations rarely share common conditions or vulnerabilities.¹⁰ Furthermore the field manual states that although centers of gravity are great target audiences, because of their low susceptibility to influences they are hard to reach with a given message.¹¹ We argue that when delivering content by digital means, key communicators, centers of gravity, aggregates, and categories should be the organizational strategies used. The reason for using these organizational strategies is further articulated as we move forward in this chapter.

Step Three is about examining existing elements that can affect the target audience, but which they have limited control over. Step Three explains how to analyze stimulus, orientation, and behaviors of the selected target audience in order to best design and test a message that will resonate with your selected target audience.

Steps Four, Five, and Six are closely related. Step Four examines the target audiences' vulnerabilities, or those needs, wants and desires that can and should be targeted with the message.¹² The example that the field manual uses

9 Department of the Army, *Psychological Operations Tactics, Techniques, and Procedures*, Field Manual 3-05.301, 5-4.

10 Department of the Army, *Psychological Operations Tactics, Techniques, and Procedures*, Field Manual 3-05.301, 5-4.

11 Department of the Army, *Psychological Operations Tactics, Techniques, and Procedures*, Field Manual 3-05.301, 5-4.

12 Department of the Army, *Psychological Operations Tactics, Techniques, and Procedures*, Field Manual 3-05.301, 5-6.

is Maslow's hierarchy of needs; in an attempt to look at how the needs are affected by long and short-term goals. The field manual does explain that Maslow's hierarchy works well to explain or examine western goals but not all cultures have the same needs.

Step Five is about developing lines of persuasion—those arguments or elements that are used to gain the desired behavior or attitude from the target audience. MISO lines of persuasion are used to exploit, minimize, or create vulnerabilities in order to persuade the TA to behave or believe in the desired manner. It is not a slogan or tagline.¹³ Also according to the field manual, developing lines of persuasions is like writing an essay or paper. There are four main elements to developing lines of persuasions: 1) Articulate a main argument. 2) Identify any necessary supporting arguments. 3) Determine what type of appeal will be useful toward a particular audience. 4) Determine which technique has the greatest possibility of success.¹⁴ A key issue with developing MISO products and the lines of persuasions on the particular products is that most MISO products employed in the field (posters, handbills, and leaflets) are one to three lines, often times not even full sentences but rather key ideas with a picture in the background. An essay is laid out very carefully with key points and supporting facts behind those key points.

Step Six deals with symbols, those elements that will visually or auditorily convey, reinforce, or enhance the meaning of the intended message.¹⁵ Symbols should be easily recognizable and have meaning to the target audience. When it comes to message design, steps Four, Five, and Six are key to developing a message that will resonate and stick with the target audience.

¹³ Department of the Army, *Psychological Operations Tactics, Techniques, and Procedures*, Field Manual 3-05.301, 5-9.

¹⁴ Department of the Army, *Psychological Operations Tactics, Techniques, and Procedures*, Field Manual 3-05.301, 5-9.

¹⁵ Department of the Army, *Psychological Operations Tactics, Techniques, and Procedures*, Field Manual 3-05.301, 5-10.

Step Seven deals with susceptibility of the target audience, this element is one of the hardest elements in which to plan for. A lot of susceptibility depends greatly on the specific target audience as identified in step two. The general population may be more susceptible to a message versus a key influencer or center of gravity.

Steps eight through ten, accessibility, effectiveness and impact indicators, are where a cyber delivery means becomes more relevant and easier to plan for. In the next two chapters we examine delivery means, such as e-mail, web page ads, and social media. Each of these delivery means assist is gaining access to the desired target audience, but still message effectiveness is hard to measure, especially when conventional means of delivery are used. In contrast, performance is more easily measured. For example, it might be shown that 200,000 leaflets were dropped or that a commercial aired on the television four times in a twenty-four hour period, but harder to know how many leaflets were picked up and read or how many people saw the commercials that aired on TV. Even harder is to have well placed and easily identifiable impact indicators. If we use the television commercial as an example, of the people that saw the commercial, how many changed their behavior based solely on the commercial?

With cyber delivery means, although it is still difficult to measure the true effectiveness of a message, it becomes easier to track. With such things as read or delivery receipts for e-mail, click counters on web page ads, “likes” on social medias sites, and a whole host of other web analytic tools, it is easier to assess the effectiveness of a cyber operation.

Throughout the entire target audience analysis process or for that matter the entire MISO process, the notion of utilizing cyber, as a delivery platform is not addressed. This could be primarily attributed to the age of the current field manuals—published in 2005. United States Cyber Command and U.S. Army Cyber Command have only been in existence for two years now, so when the field manuals were written not a lot of planning guidance existed for the use of cyber as a delivery platform for MISO. We are not asserting that the current

MISO delivery methods be discounted or thrown out, but rather cyber be considered as a viable means of delivery in today's digital environment. So how is it that we can start using cyber to inform or influence individuals or groups, and integrate target audience analysis in to the cyber planning process?

B. GEOLOCATION

Cyberspace is the most under-utilized medium for current Information Operations that inform or influence a target audience based on current objectives. If the military were to use geolocation to identify the location of specific target audiences, then campaigns similar to targeted marketing campaigns could then be launched. The use of cyber will not work in all areas of the world, but as Internet capability and use grows around the world, the military should use this platform to its fullest advantage.

We offer two examples where geolocation and a targeted campaign could have been used. One is in a non-permissive environment (an environment where there is a possible or probable enemy threat), while the other in a permissive environment (an environment where there is little or no enemy threat). For the first example in a non-permissive environment, we consider Afghanistan. Nearly 1.08 million of the 30.4 million people that live in Afghanistan have Internet in their house or have access to the Internet, representing nearly four percent of the population. Of this population over 77,000 attend college or universities, representing a prime target audience.¹⁶ During the twelve years that the military has occupied Afghanistan, millions of dollars have been spent on posters and leaflets that were scattered across the country with the intent to influence the masses. What if instead of leaflets being dropped overnight, we were able to geolocate all of the Internet cafes within the city and map the topology of the cafes and related in-home users based on domain similarities, and then design

¹⁶ Javid Hamdard, "The State of Telecommunications and the Internet in Afghanistan Six Years Later (2006–2012)" *USAID Assessment Report, March 2012* (Afghanistan Media Development and Empowerment Project, 2012) 9, accessed 4 October 2012, <http://www.internews.org/research-publications/state-telecommunications-and-Internet-afghanistan-six-years-later-2006–2012>.

an ad campaign linked to the mapped IP addresses. If geolocation were refined and accurate enough, then a messaging strategy could be targeted at any level from one host to a neighborhood or a whole city.

For the second example, we considered a Humanitarian Assistance / Disaster Relief (HA/DR) mission in a permissive environment utilizing either an established network backbone if it is still intact and working or a Hastily Formed Network (HFN) established by the military or a non-governmental organization (NGO). The intent with messaging using geolocation during an HA/DR mission would be to inform people of ongoing efforts or route them to emergency services. If, for example, an HFN was established during the tsunami crisis in northern Japan that included Wi-Fi, the controlling agency would own the DNS servers and could establish a splash page, similar to those seen in hotels when you log into a hotel network, to provide emergency information and a way to log or check in to ease in personnel recovery. In addition to locating people, geolocation could be used to target information to an audience in a specific area, and to act as a type of firewall to limit access to only those individuals / groups in the affected area.

As Internet usage expands the need for finding the geographic location (geolocation) of a physical computer is growing. To geographically locate a computer in the physical world the Internet Protocol (IP) address is normally used through one or more techniques to locate the physical location of the host. Mapping an IP address to the actual physical geographical location is difficult because the IP address provides no location identifiers for the host and that host could be located anywhere in the world. In this thesis we examine current uses for geolocation, current techniques for geolocation, and future uses for the military in employing geolocation for use in Information Operations.

Uses for geolocation of IP addresses are growing, specifically in today's cyber environment. It is being used to target users with local news, in specific marketing campaigns, and for restricting digital content viewing/listening or sales to authorized geographic locations. IP logging and locations services helps to

prevent online fraud within the marketplaces and in the future “the growth of infrastructure-as-a-service clouds, such as Amazon’s EC2 service, may also drive organizations using cloud computing to employ geolocation.”¹⁷ The military is not the only organization that could use geolocation to assist with the missions, law enforcement or other government agencies that need to locate and prosecute alleged criminals, especially if the crime was committed outside of the jurisdiction of where the crime took place could benefit greatly.¹⁸ Although there are many ways to get around these specific controls, such as TOR Browsers, Proxy Servers etc., the benefits of trying to accurately geolocate a host far outweigh the number of people that will try to circumvent the geolocation techniques.

There has been research done on IP geolocation for almost a decade, so how is it done?¹⁹ Dahnert suggests in his article that “current technology for IP geolocation can be separated into two broad categories, semantic based and measurement based. Semantic based approaches determine location by retrieving information about an IP address based on DNS queries or a “Whois” lookup and parsing that data in order to associate a physical location.”²⁰

Measurement-based geolocation algorithms use a set of geographically distributed landmarks with known locations to locate the target IP. Landmarks, are physical locations that exist within a particular postal region, including various types of businesses, schools or colleges and even regional government offices that also have an associated Internet domain name (e.g., “nps.edu” or “csumb.edu”) and usually a web based presence.

17 Phillipa Gill et al., “Dude, where’s that IP? Circumventing measurement-based IP geolocation,” Usenix Security Symposium, August 2010, accessed 25 October 2012, http://www.usenix.org/events/sec10/tech/full_papers/Gill.pdf.

18 Art Dahnert, “Hawkeyes: An Advanced IP Geolocation Approach,” (Austin, TX: Overwatch Systems Ltd) accessed 25 October 2012, <http://ieeexplore.ieee.org/stamp/stamp.jsp?Tp=&arnumber=5978788&isnumber=5978775>.

19 Gill, “Dude, where’s that IP?”

20 Dahnert, “Hawkeyes: An Advanced IP Geolocation Approach.”

Landmarks are used to measure various network properties, such as delay, and the paths taken by traffic between themselves and the target. These results are used as input to the geolocation algorithm, which uses them to determine the target's location. Initially landmarks were used in Shortest Ping (SPing) to try to measure the delay from ICMP ping packets to the host to determine geolocation.²¹

Geolocation algorithms mainly rely on ping and traceroute measurements. Ping measures the round-trip time (RTT) delay between two machines on the Internet, while traceroute discovers and measures the RTT to routers along the path to a given destination.

The Constraint-Based Geolocation (CBG) approach “infers the geographic location of Internet hosts using multilateration. Multilateration refers to the process of estimating a position using a sufficient number of distances to some fixed points . . . A key element of CBG is its ability to accurately transform delay measurements into distance constraints.”²² As with any distance measuring in cyberspace, it is hard to predict how data will flow through different nodes within the network. Also there is no guarantee that the data will travel the same route every time. Within the CBG algorithm they have tried to minimize what they call “additive distortion[s],” the excess delays experienced through normal traffic.²³

Statistical IP geolocation “consists of several steps. First, a “profile” of each landmark is constructed using the distance- delay pairs amongst the landmarks, resulting in a scatterplot for each landmark. Second, the joint probability distribution of the distance and delay is approximated using bivariate

21 Inja Youn, Brian L. Mark and Dana Richards, “Statistical Geolocation of Internet Hosts,” (Fairfax, VA: George Mason University, 2009) 2, accessed 24 October 2012, <http://napl.gmu.edu/pubs/CPapers/YounMarkRichards-ICCCN09.pdf>.

22 Gill, “Dude, where’s that IP?”

23 Bamba Gueye et al., “Constraint-Based Geolocation of Internet Hosts,” *IEEE/ACM Transactions on Networking*, Vol.14, No.6, Dec. 2006, 1220, accessed 24 October 2012, http://www-rp.lip6.fr/site_npa/_publications/682-p1219-gueye.pdf.

kernel density estimation. A Gaussian kernel is used for density estimation. Finally, a force-directed algorithm is used to obtain an estimate of the target location.”²⁴

Topology Based Geolocation (TBG) “uses the network layout or topology to assist in determining where a particular IP address resides. At the very least, there are limitations to the accuracy of these techniques, mostly due to the delay encountered at various hops in between the source and destination addresses.”²⁵ Some errors encountered when using this technique to geolocate can be seen with domains such as California .edu (nps.edu, csumb.edu) or .mil domains, because they are tied into a larger backbone. Even though they are hosted on site, the geolocation comes back to somewhere other than the specific location of the hosts.

Using Octant to geolocate “provides an intuitive and generic frame-work which represents node positions precisely using regions, expresses constraints succinctly as areas, and computes positions accurately by solving a system of geometric constraints. A small number of landmarks whose positions are approximately known anchors the constraint system to the physical globe.”²⁶

All of the above-mentioned algorithms and techniques are for use under the current Internet Protocol version 4 (IPv4), but as the world transitions to IPv6 there could be issues with how traffic is handled and managed under the new protocol. Under the current system, landmarks are kept in a database to be accessed easily but with IPv6 and every device with a separate and unique address, the databases could become unmanageable.²⁷ One solution to the

²⁴ Youn, “Statistical Geolocation of Internet Hosts.”

²⁵ Dahnert, “Hawkeyes: An Advanced IP Geolocation Approach.”

²⁶ Bernard Wong, Ivan Stoyanov, and Emin Gün Sirer, “Octant: A Comprehensive Framework for the Geolocalization of Internet Hosts” Symposium on Networked System Design and Implementation, (Cambridge, MA, April 2007) accessed 25 October 2012, <http://www.cs.cornell.edu/~bwong/octant/papers/>

²⁷ Youn, “Statistical Geolocation of Internet Hosts.”

sheer volume of address available under IPv6 is to encode geolocation information into the headers, similar to encoding geolocation information or tags into DNS tables.

If we can geolocate computers on the Web, and even map computers located on the same domain, then is it possible to begin to map the topology of the Internet? Using tools such as those located at ip-lookup.net we can not only find out information for any known IP address, we can do a Whois search and then find out what other IP address are neighboring the searched for IP address. Once we have neighboring IP address we can ping them to ensure that they are active and then, using a geolocation tool, begin to lay out the topology of a given domain.²⁸

Now that we have a way in which to geolocate an IP address, how do we get the IP address we need? One way is to examine existing webpages for a given area, similar to locating landmarks, or we could use e-mail headers. No matter what service you use to send e-mail—G-mail, Hotmail, Outlook—an outbound IP Address is embedded into the e-mail header that can then be geolocated back to where the e-mail was sent from. Obviously the challenge here is that if the e-mail is sent through an anonymous re-mailer, proxy or similar service to mask the outbound header information, then it is impossible to trace it back to its source.

Even though these tools exist on the net, significant challenges still exist in any approach to measure and chart Internet topology. First, the lack of inherent support for topology measurement coupled with ISPs desire to keep much of this information private, calls for a distributed measurement infrastructure and structural inference methods that are reliable and robust. Next, the vast size and

²⁸ *IP Lookup*, accessed 24 October 2012, <http://ip-lookup.net>.

global footprint of the Internet suggest that a potentially significant number of measurement systems will be required in order to gather sufficient data to generate comprehensive maps²⁹

Once the location of our target audience is discovered, another piece of the cyber target audience analysis is content and Web analytics. Although we are not going to discuss message design in this paper, the concept of analyzing current content on a web page or social media site is relevant prior to message delivery. Also, knowing who is visiting the website from where and how often becomes important. If we choose to place an English language ad on a Dari language news website, the message would be lost and irrelevant to the target audience.

C. WEBSITE CONTENT ANALYSIS

A good example of content analysis being done on websites is the work of Dr. Dana Janbek from Lasell College; her work is specifically targeting terrorist and jihadist websites. Although her work does not include evaluating the content to generate a counter message, the metrics that she uses are very similar to those used by the U.S. Army. Dr. Janbek evaluated 30 websites using both quantitative and qualitative analysis over 60 variables.³⁰

Dr. Janbek uses six basic elements of the communications process for content analysis.³¹

- Who is the source of the message?
- What is the message?
- Who are the audiences?
- How and through what channels is the message communicated?

29 Brian Eriksson, Paul Barford and Robert Nowak "Estimating Hop Distance Between Arbitrary Host Pairs," in INFOCOM 2009 Proceedings, IEEE, 19–25 April 2009, 801.

30 Dana M. Janbek, "What We Can Learn From jihadist websites- A Content Analysis." (Lecture, Naval Postgraduate School, Monterey, CA, 19–20 June 2012) 3.

31 Philip Seib and Dana M. Janbek, *Global Terrorism and New Media: The post-Al Qaeda generation*, (New York, NY: Routledge, 2011) 45.

- What is the purpose of the message?
- What is the effect of the message?

This six-step process is similar to the process used by IO planners when developing either a narrative or counter-narrative to address a specific target audience. These six steps are further broken down in chapter three of Dr. Janbek's book *Global Terrorism and New Media*. To summarize Dr. Janbek's finding, we can see in Figure 1 a summary of the purpose and target audiences that terrorist networks are trying to convey their message too by utilizing the Internet.³² With the Internet being a new technology there are relatively few regulations that address actions or content.³³

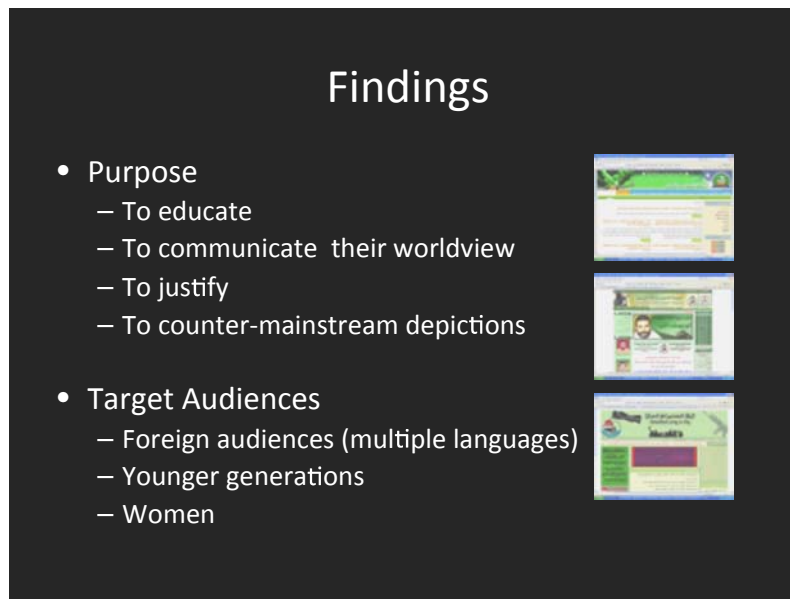


Figure 1. Reasons that terrorist organizations use the Internet³⁴

In 2005, al-Zawahiri stated: “we are in a battle, and more than half of this battle is taking place in the battlefield of the media. We are in a media battle for

³² Seib and Janbek, *Global Terrorism and New Media*, 59.

³³ Seib and Janbek, *Global Terrorism and New Media*, 58.

³⁴ Janbek, “What We Can Learn From jihadist websites,” 11.

the hearts and minds of our ummah.”³⁵ Now seven years later Janbek states, “for the terrorists themselves, new media are, collectively, a transformative tool that offers endless possibilities of communication in expansion.”³⁶ Janbek goes on to assert that websites such as YouTube.com have proven to be a great tool for terrorist groups to advertise themselves and their activities. The Internet provides an attractive setting to the youth of today; computers are commonplace in all parts of the world, providing a great venue to manipulate and portray a strong message openly.³⁷ In Figure 2, Janbek demonstrates media within the Internet that terrorists can use to pass their message. These same outlets can also be used by the U.S. military to convey a message or counter-message, which will be discussed further in the next chapter.

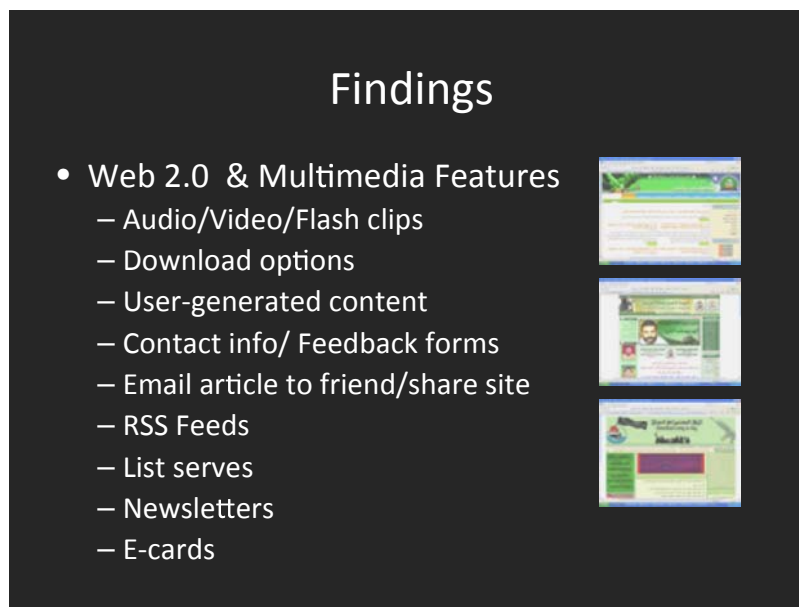


Figure 2. Elements within the Internet that can be used to pass messages³⁸

³⁵ Seib and Janbek, *Global Terrorism and New Media*, 31.

³⁶ Seib and Janbek, *Global Terrorism and New Media*, ix.

³⁷ Seib and Janbek, *Global Terrorism and New Media*, ix.

³⁸ Janbek, “What We Can Learn From jihadist websites,” 10.

Authors Daniel Booth and Bernard Jansen in their article “A Review of Methodologies for Analyzing websites” discuss in great detail web analytics and metrics that can be used to measure visitor behavior on a website.³⁹ Table 1 shows example types of metrics that might be found in analyzing websites. The metrics generally fall into one of four categories: site usage, referrers (or how visitors arrived at your site), site content analysis, and quality assurance.⁴⁰

Site Usage	Referrers	Site Content Analysis	Quality Assurance
<ul style="list-style-type: none"> Numbers of visitors and sessions How many people repeatedly visit the site Geographic information Search Engine Activity 	<ul style="list-style-type: none"> Which websites are sending visitors to your site The search terms people used to find your site How many people place bookmarks to the site 	<ul style="list-style-type: none"> Top entry pages Most popular pages Top pages for single page view sessions Top exit pages Top paths through the site Effectiveness of key content 	<ul style="list-style-type: none"> Broken pages or server errors Visitor response to errors

Table 1. Metrics that might be used to measure visitor behavior on a website.⁴¹

Table 2 outlines the eight common website metrics discussed by Booth and Jansen to measure visitor behaviors. Most notable for this thesis is the demographic and system statistic, which measures the physical location and information of the system used to access the website. This information ties directly back into the geolocation data that was discussed previously. In the paper, Booth and Janssen use the example “websites that provide region-specific services.”⁴² The idea of providing region specific services will be discussed more in depth in the next chapter.

39 Daniel Booth and Bernard Jansen, “A Review of Methodologies for Analyzing websites,” in *Handbook of Research on Web Log Analysis*, ed. Bernard. J. Jansen, Amanda Spink and Isak Taksa, (Hershey, NY: IGI Global, 2009), 141–163.

40 Booth and Jansen, “A Review of Methodologies for Analyzing websites,” 142.

41 Booth and Jansen, “A Review of Methodologies for Analyzing websites,” 141.

42 Booth and Jansen, “A Review of Methodologies for Analyzing websites,” 143.

Metric	Description	Category
Visitor Type	Who is accessing the Website (returning, unique, etc.)	Site Usage
Visit Length	The total amount of time a visitor spends on the Website	Site Usage
Demographics and System Statistics	The physical location and information of the system used to access the Website	Site Usage
Internal Search Information	Information on keywords and results pages viewed using a search engine embedded in the Website	Site Usage
Visitor Path	The route a visitor uses to navigate through the Website	Site Content Analysis
Top Pages	The pages that receive the most traffic	Site Content Analysis
Referring URL and Keyword Analysis	Which sites have directed traffic to the Website and which keywords visitors are using to find the Website	Referrers
Errors	Any errors that occurred while attempting to retrieve the page	Quality Assurance

Table 2. Eight common metrics of website analysis⁴³

In their paper, Booth and Jansen discuss key performance indicators (KPIs). The authors note that “unlike metrics, which are numerical representations of data collected from a website, KPI’s are tied to business strategy that are usually measured by a ratio of two metrics.”⁴⁴ The KPI’s as discussed are very similar to what the Army terms measures of effectiveness (MOE’s).

In this chapter, we discussed the Army target audience analysis process, examined geolocation, and looked at different ways of evaluating content and analytics on a website. Using these techniques we can design a strategy to use cyber as a delivery tool of information operations to conduct inform or influence activities as they relate to military operations. In the next chapter, we look at specific delivery methods that can be employed after the target audience analysis has been conducted.

43 Booth and Jansen, “A Review of Methodologies for Analyzing websites,” 143.

44 Booth and Jansen, “A Review of Methodologies for Analyzing websites,” 149.

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III. MESSAGING STRATEGY

In the last chapter we discussed how we could conduct target audience analysis and website analysis so that content could be developed that could be catered to a specific audience with specific objectives and end state clearly defined. In this chapter we examine three specific delivery methods: webpage advertising, e-mail delivery, and social media. After briefly discussing each of these methods, we will examine two case studies. The first one is from the J39 shop of European command, and the second from a startup company in San Francisco California that developed an iPhone application for service members and their families.

Of the three delivery methods, webpage advertising is most like a civilian marketing campaign. By incorporating techniques from the last chapter such as geo-locating and web analytics, the military can deliver specific content to a specific target audience. As the Internet and webpages have advanced, it has become easier to cater content to very specific audiences. The idea of delivering targeted marketing is being used by both small and large companies and through both static platforms such as home computers and mobile platforms such as smart phones.

Normally when the military is trying to influence or even inform an audience, the target population is 18 to 35 years old, which happens to be the average age group of most computer users; this is due to use of computers in colleges and universities or for job related activities. An assumption can be made that if somebody is using the computer, they are most likely literate. In many of the countries in which the United States military is currently operating, the number of people that can both read and write, and, therefore, understand and interpret the meaning of what they're reading is a low percentage of the population. This makes reaching these people within the population all the more important, because they become the influencers and key information nodes.

The need to reach this literate, online population becomes evident when we look at conventional MISO delivery means such as a leaflet drop. Flooding an area with thousands or hundreds of thousands of leaflets in order to influence a specific target audience is often not effective; as many of the people who pick up the leaflets may be unable to read them, and those who can may not bother to pick them up. On the other hand, using a cyber delivery system with detailed target audience and content analysis, the right message can be delivered to the right people at considerable cost.

As an example, consider a drop of 100,000 leaflets, each 6" x 3" and in four colors on both sides. The material costs alone are \$1200. In addition, there are costs for the platform that the leaflets are distributed from, whether it is a C-130 or UH-60 helicopter, as well as costs for the crew, aircraft fuel, and the team that must design, print, and prepare the leaflet drop.⁴⁵ In addition to these costs, leaflet drops require coordination with units on the ground. For example, while serving in Southern Iraq in 2009, the Division Headquarters wanted to conduct a leaflet drop in order to influence a group of individuals to cease aggression against U.S. and Iraqi military forces.⁴⁶ At the time, the brigade that was the battle space owner had just completed a Civil Affairs project, where over \$500,000 was spent to employ locals to clean up trash and debris in the streets of the town where the Division wanted to conduct the leaflet drop. The time, effort, and money that would have been wasted had the Division chosen to move forward with the leaflet drop would have been ridiculous. This is highlighted further with the fact that U.S. and Iraqi military forces were able to freely move whenever and wherever they wanted through the town and entire area, so if MISO products needed to be delivered the more effective face-to-face method of product distribution should have been used.

⁴⁵ Department of the Army, *Psychological Operations Tactics, Techniques, and Procedures*, Field Manual 33-1-1, 5 May 1994 (Washington D.C.: GPO, 1994) Table G-3.

⁴⁶ The Division Headquarters was over 250 miles away in Baghdad.

A. WEBPAGE ADVERTISING

There are two types of advertising on webpages. The first is search engine optimization, which is that advertising that shows up when a user queries a search engine such as Google, Yahoo, or Bing. This type of ad is normally a link to another website and usually shows up first in the list of returns from the web search or on the side as a highlighted related search. Ads that appear during webpage searches are normally paid for by the advertiser and rely on a target webpage to be linked to. Although search engine optimization can be done, the advertiser must rely on a user searching for their specific product or products that have similar characteristics; because this method takes target audience input into the search engine, we are unable to target specific users with our targeted content. For targeted content delivery we want to focus on specific advertisement delivery and not rely on a search engine to deliver content; therefore, we will skip this type of advertisement. The second type of advertisement is what's known as a banner advertisement. This is a box that is self-contained within a webpage that when clicked on can have multiple functions. Although a banner ad cannot guarantee the user will click on the ad, proper placement on the webpage will most certainly guarantee at least a visual image delivered to the user. According to benchmark communications "the average click through to most websites is roughly 2 to 5%."⁴⁷ This number may sound low, but if the ad is placed on a website that your target audience repeatedly visits, the probability that they will click on the Web ad could potentially increase every time they visit the website.

The placement of a banner ad on high traffic websites can cost \$20–\$50 per thousand per month (CPM) under a minimum number of impressions, usually 100,000. That means a banner ad on Yahoo could cost you anywhere from \$2,000 to \$5,000 per month.⁴⁸

⁴⁷ Prudens Consulting Limited, "Advertising On The Internet," Benchmark Communications, accessed 24 October 2012, http://www.bmcommunications.com/int_ad.htm.

⁴⁸ Prudens Consulting Limited, "Advertising On The Internet," Benchmark Communications.

As more and more websites move to dynamic webpage delivery, we propose that the military invest the money that they normally spend on typical print media such as leaflets or handbills, which have a very short product placement time, on banner ads for dynamic webpages. We recommend dynamic content delivery because of the ability to adapt to specific target audiences within a specific geographical region. If we use techniques as specified in the last chapter such as geolocation and other web analytics, we can deliver banner ads to specific Internet protocol domains and cater the contents based on browser settings such as language.

Using Kabul, Afghanistan as an example, we could deliver content to two different Internet cafés within the city based on IP geolocation, each with distinct messages that target their different audiences. The ads could be written in different languages, but hosted on the same website, such as local news sites where multiple audiences visit to stay informed about local current events.

Techniques such as Online Behavioral Advertising (OBA) could also be used to assist in delivering specific content to a desired target audience. “Online Behavioral Advertising uses information collected across multiple websites that you visit to predict your preferences or infer interests and to show you ads that are more likely to be of interest to you. The goal of online behavioral advertising is to make the ads you see more relevant to you based on the types of sites you visit on the Web.”⁴⁹

For the military being able to report back successful metrics is important but difficult, especially when utilizing conventional MISO delivery techniques. By using webpage content delivery such as banner ads paired with analytics suites to measure content delivery along with such things as click counts, it becomes much easier to give hard facts and be able to accurately report influenced

⁴⁹ Network Advertising Initiative, “Education Resources,” accessed 24 October 2012, <http://www.networkadvertising.org/consumer-education/education-resources>.

behavior. Influenced behavior may be as simple as the target audience clicking on the banner ad to view more detailed information or receive more information.

B. E-MAIL DELIVERY

There are two types of e-mail deliveries that the military could use; first is unsolicited message or spam e-mail, and second is an opt-in e-mail, similar to e-mail marketing conducted by online vendors. There are a few issues with sending unsolicited e-mail out in today's cyber environment. First and foremost is the inability to reliably associate a person with an e-mail address. This is important if the military is using e-mail delivery for delivery of MISO products. If the military uses e-mail strictly for inform campaigns such as rapidly disseminating public affairs news releases to an audience, it is more viable. The second issue is that many e-mail systems have good spam filters with well-defined rules that filter out most mass e-mails. Although there are ways around spam filters through careful word selection, spam filters are evolving to even pick up these types of work a rounds.

E-mail delivery could be most viable with some sort of opt-in method for the target audience. This opt-in option could be invoked when a user clicks on a banner advertisement by redirecting them to a form or another webpage where they could opt to receive e-mail updates on specific topics. With e-mail delivery, there could be both an opt-in and opt-out option, with content targeted to specific users or groups of users within an area.

Unlike the banner advertisement campaigns, the military could not use an Internet café, IP domain, or other geolocation techniques for e-mail campaigns. In today's cyber environment, most Internet service providers in smaller markets do not host e-mail servers, so many customers use services such as Gmail, Hotmail, or Yahoo.

Another way of delivering e-mail to a specific domain or user group would be to partner with the group's provider. One possible partner would be the local university or college system. If we consider Afghanistan and narrow it down to

the city of Kabul, we could ask the universities that are located within the city to send out an e-mail to all of their users. The recipients could include all students and instructors, which would fit our primary target audience of the 18 to 45-year-olds. This concept will be discussed further in the next chapter as we look at modeling the spread of an e-mail campaign using a base target audience.

C. SOCIAL MEDIA

The third option in targeting a specific audience is by using social media. This is an active research area, specifically in light of the Arab Spring, which is often attributed to the use of Twitter and other social media. Here in the United States, most people know social media as MySpace, Facebook, Twitter, Pinterest, and Instagram. Although these social media sites are being used worldwide, they may not be as prevalent in the country that the U.S. Military is operating in. If the military would like to continue to use social media to inform and influence, then a key part of the intelligence preparation of the battlefield (IPB) needs to be to identify the social media that are being used by citizens within the country.

In looking at Facebook as a social media delivery system, there are several ways to target an audience through this medium. One way would be for the U.S. military to join specific groups and actively engage or post content within these groups. These groups offer a way to interact and engage with people that is similar to the face-to-face interaction that MISO teams do in the open population. Another way would be for the military to place advertisements on Facebook. The funds for these could come out of the MISO budget just as those for developing posters hung within a target area are taken from the MISO budget. The key to the online advertisements would be the ability to target a specific audience with the advertisement. When designing an advertising campaign, Facebook allows you to use specific criteria such as age range, geographic location, and interests to define your target. We will examine this further in the

next section as we look at EUCOMs use of Facebook to target the Balkans with their MISO campaign and Southeast European Times.

D. EUROPEAN COMMAND'S SETIMES FACEBOOK INITIATIVE

Most of the Combatant Commands have in place a program called the Regional Web Initiative. These are programs funded by MISO program dollars for developing websites that are fully attributed to the United States. The concept of developing influence websites extends from regional radio stations such as Voice of America, run by the State Department, to others run by the military. Radio stations have been used around the world since World War II to conduct both MISO and military deception. The newer websites, although not being used for deception, are being used to influence the behaviors of the online enthusiast.

In 2009, LTC Jamie Efaw and SFC Christopher Heidger took over the operations of the U.S. European Command eight-year-old regional web initiative, Southeast European Times (SETimes), which provided a central source of news and information about Southeastern Europe. In addition to the website, Efaw and Heidger's predecessor had established a Facebook presence eight months prior to their arrival. Upon assuming control of the Facebook page, Efaw and Heidger used it as a baseline for measuring their efforts to expand their audience. "A year after its creation, the SETimes' Facebook page gained an average of less than one fan per day, for a total of 306 . . . Our audience was largely U.S.-based, and there were more English-speaking fans than all other languages combined."⁵⁰ The numbers are significant, but even more important is that the main language was English. By comparison, the SETimes website was offered in ten languages: Albanian, Bosnian, Bulgarian, Croatian, English, Greek, Macedonian, Romanian, Serbian, and Turkish.

Based on the initial data from Facebook, Efaw and Heidger set four goals:

⁵⁰ James Efaw & Christopher Heidiger, "Another Tool in the Influencer's Toolbox," Global Ecco, accessed 24 October 2012, <https://globalecco.org/97>.

- Take advantage of the existing social media community to introduce and draw them to SETimes.com.
- Provide an additional forum that exposes our target audience to our themes and messages.
- Provide a convenient place for the SETimes community to discuss regional topics of interest and interact in an environment where they are comfortable and familiar.
- Establish a communication platform we could use during a crisis, humanitarian assistance, or disaster relief operation.

Efaw and Heidger set out to meet these goals by establishing a four-phase approach. Their intent was to establish a stronger SETimes presence on Facebook, continuously evaluate their efforts in order to improve the page, focus on getting the word out to the target audience through a targeted marketing campaign, increase user interaction, and finally shift the focus onto established social networks.

Over the course of one year (from March 2010 to January 2011), SETimes on Facebook had an increase of over 6,700 fans as seen in Figure 1.

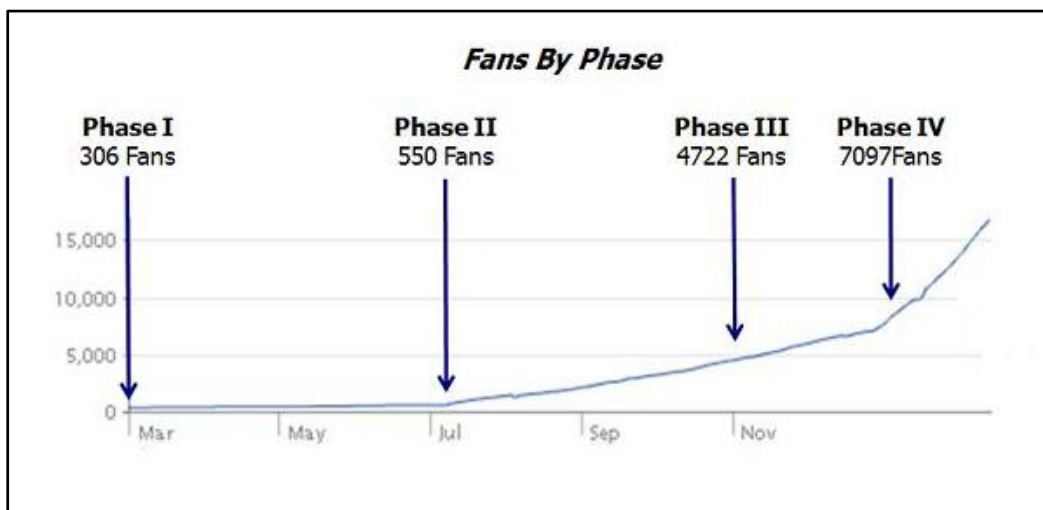


Figure 3. SETimes Facebook Fan Growth by Phase (March 2010-January 2011)⁵¹

⁵¹ Efaw & Heidiger, "Another Tool in the Influencer's Toolbox," <https://globalecco.org/97>.

Of the four phases, Phase Two, focused advertising, is where Efaw and Heidger attribute the majority of the growth. Spending only \$5 per day, Efaw and Heidger were able to design advertisements that focused in on specific target audiences based on demographic data provided by the individual Facebook users.⁵² Even though Efaw and Heidger only used the ads on the Facebook page to increase the number of fans, they recognized that “these ads can satisfy many objectives including: advertising an event, directing people to a website, or simply getting a target audience to download an application.”⁵³

What started in March 2010 as a two-man effort with a small \$5 a day budget has increased exponentially. Starting with only 306 fans, after two and a half years they had 423,755 likes and 11,517 people talking about the Facebook site.⁵⁴ Efaw and Heidger used Facebook as a specific delivery platform in order to influence people to discuss regional topics and to drive their browsing towards the SETimes.com website.

E. ADJACENT APPLICATIONS AND CALL DIBS

Another approach to influencing online browsing behavior is being attempted by a small start-up company based in San Francisco, California. Adjacent Applications is using conventional influence techniques to drive their marketing campaigns.

On 1 June 2012, Adjacent Applications introduced an iPhone-specific application named Call Dibs in the Monterey Bay area of California. The Call Dibs app is a service-oriented application that allows users to buy and sell personal items to other users. What is unique about the Call Dibs marketing campaign is that it only targets Department of Defense affiliated individuals with an iPhone. Adjacent Applications’ intent to narrow their target audience is similar to an IO campaign that targets a category of people as discussed in the last

52 Efaw & Heidiger, “Another Tool in the Influencer’s Toolbox,” <https://globalecco.org/97>.

53 Efaw & Heidiger, “Another Tool in the Influencer’s Toolbox,” <https://globalecco.org/97>.

54 Facebook, “SETimes,” accessed 1 October 2012, <https://www.facebook.com/SETimes>.

chapter. Where it becomes even more similar is when we take a look at the Adjacent Applications marketing scheme.

For the Call Dibs app, Adjacent Applications has formed “Ambassador Teams.” These teams are comprised of one to five individuals that assist with marketing events. The marketing events include face-to-face interaction and handing out of pamphlets, business cards, water bottles, tee shirts, and re-usable grocery bags. The teams also hang banners at key events military members are known to frequent, such as post-wide yard sales, or sporting events. The ambassador teams have even branched out into “mailer” campaigns; this is where a 5x8 post card advertisement is sent to every house in the military housing area. All of these actions were done to try to influence their target audience to go online to download the Call Dibs application.

Since the official launch of the Call Dibs app, there has been an average new user download rate of 20% as seen in Figure 2. The month of July shows only a 9% new user download, most likely attributed to only four marketing events that took place that month, as opposed to six to eight every other month.

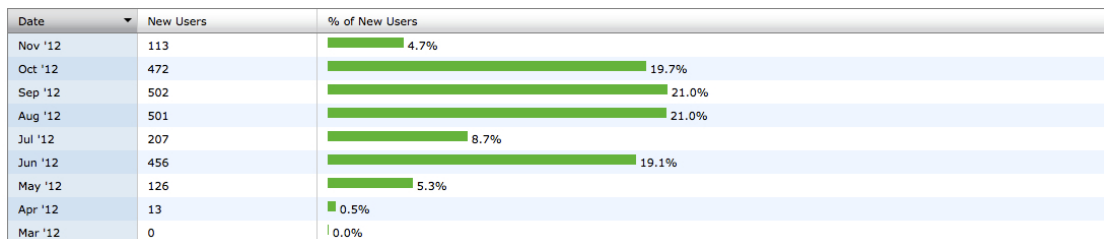


Figure 4. Call Dibs App New User downloads by month.⁵⁵

One aspect of influence operations is being able to get someone to do something, but also to be able to replicate or sustain that action. Figure 5 below shows by month the number of sustained active users. The data shows that there has been a total of 2,390 total downloads with 1,098 users actively using the

⁵⁵ Flurry.com, “New Users,” Call Dibs Analytics, accessed 5 November 2012, <http://www.flurry.com>.

application. In five months the total number of downloads, sustained active users, and time spent using the application has continued to grow. Figure 6 below shows the number of times the Call Dibs app has been opened. This number accounts for new users who have downloaded and tried it that month as well as active users who continue to use the app on a regular basis. In the month of October the application was used 15,833 times; the metrics show that as the number of users increased, the number of application sessions increased at approximately the same rate.

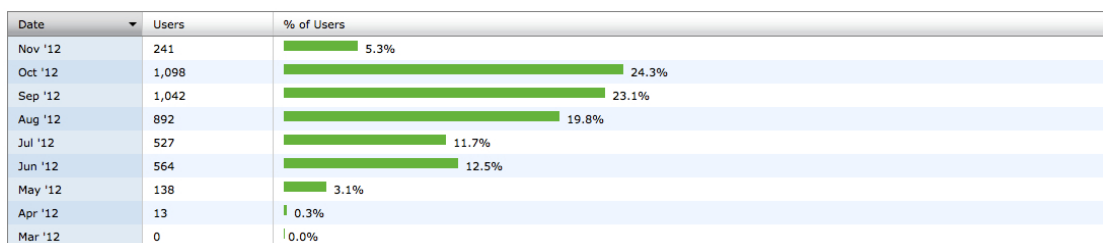


Figure 5. Call Dibs App Active Users by month.⁵⁶

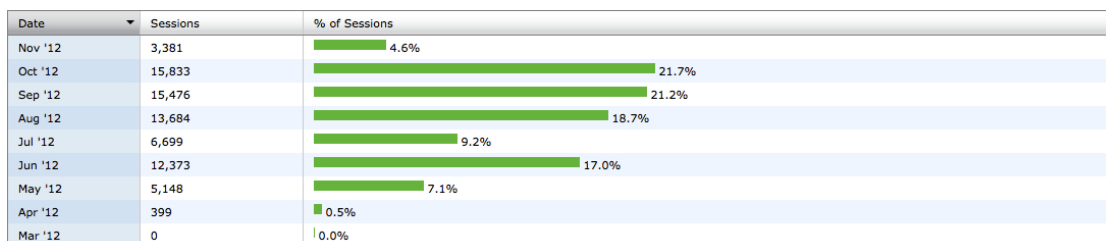


Figure 6. Call Dibs App Sessions by month.⁵⁷

These metrics from Adjacent Applications are relevant because they show a correlation to what a MISO team assigned to a Brigade Combat Team or Special Operations Detachment could do with very few resources given time and direction. Although Adjacent Applications is a for-profit company, as of 1 November 2012, they have not used the Call Dibs app to gain any profit. Their

⁵⁶ Flurry.com, "Active Users," Call Dibs Analytics, accessed 5 November 2012, <http://www.flurry.com>.

⁵⁷ Flurry.com, "App Sessions," Call Dibs Analytics, accessed 5 November 2012, <http://www.flurry.com>.

marketing budget is far less than what a MISO team spends on a handbill or leaflet campaign, but in our estimation far more effective with measurable results.

In order to gain more of a foothold within the military community, the Adjacent Applications development team started a Facebook page to coincide with the launch of the Call Dibs app. With the Facebook page there has been measured growth from zero fans to 487 fans as of November 6, 2012. Although 487 fans does not seem like a large number, using Facebook analytics we can see that with 487 fans, there is the potential to reach 159,310 people. This number is based on the number of friends that each person has, and if each one of those friends saw a Call Dibs posting.⁵⁸ In order to boost the number of fans on Facebook, the Ambassador Teams are also posting information about Call Dibs, including the application's capabilities, uses, and where it can be downloaded, onto rival pages that deal in similar services. Within the Monterey Bay community, there is a Facebook page called Fort Ord Freecycle. This is a competitive service to Call Dibs, so members of the Ambassador Team post comments to the site, referring people to the Call Dibs app. The majority of time, the Ambassadors post their narrative overtly in an attempt to gain fans and ultimately downloads of the product.

As Call Dibs and Adjacent Applications continue to expand, their intent is to develop additional marketing techniques. Currently the development team is refining and optimizing search engine criteria, ensuring that when someone uses Google for a specific key word search, the Call Dibs webpage will consistently be in the top ten percent of the search results. The marketing team is also exploring options to place marketing banner advertisements on military specific websites such as Military.com and MilitaryByOwner.com, again marketing and refining content to message to a very specific target audience.

⁵⁸ Facebook, "CallDibsApp" accessed 15 October 2012, <https://www.facebook.com/CallDibsApp>.

Conducting analysis of a specific target will allow the U.S. military to develop content that is relevant to that target. Further, by understanding the information environment, an effective delivery method can be used.

In this chapter, we examined three specific delivery techniques, webpage advertising, e-mail campaigns, and social media, and discussed some of the benefits and challenges with each. We also looked at two different case studies, one that used Facebook to expand the viewership of SETimes, and one that has used tradition MISO tactics to influence people to download an iPhone application. Utilizing cyberspace to conduct inform and influence operations is an expanding reality.

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IV. DISTRIBUTION MODELING

In today's connected world of e-mail, Internet, news, and social media, people seem to be highly connected with each other and the world. Even developing countries with little to no infrastructure, such as Afghanistan, have the benefit of trends in cellular technology and smart phones. Within this emerging environment, there are many unanswered questions. What is the best way for a company or marketing firm to reach its target audience in order to advertise a product or service? How can the U.S. or any nation-state government use cyber messaging to effectively inform the population of a specific town, region, or demographic of a possible disaster? How does the U.S. Army target a specific audience in a given locale without having to blanket an area with printed leaflets dropped from an aircraft as it has in past decades? This study seeks to create a model to maximize the distribution of a message through cyber means such as e-mail or social media in a minimum amount of time.

Research on viral marketing is increasing in popularity, especially with the growth of e-mails, videos on YouTube, and posts on social media websites such as Facebook. However, there are yet no models that can “predict how many customers a viral marketing campaign will reach and how marketers can influence this process through marketing activities.”⁵⁹ If a company could determine a way to maximize the number of people who would likely purchase a product or service, they could drastically reduce advertising costs and boost profits.

Mass e-mailing an advertisement to individuals is only marginally effective. Marketing firms do not have a way to predict how a message will spread. So, much like a massive leaflet drop, they send out blanket e-mails that generally resemble spam. There are of course pros and cons to this method. On the one

⁵⁹ Ralf van der Lans, et al., “A Viral Branching Model for Predicting the Spread of Electronic Word of Mouth” in *Marketing Science* Vol. 29, Issue 2, March 2010, (Institute for Operations Research and the Management Sciences, Linthicum, MD) 1.

hand, the e-mail reaches a large population. On the other, these e-mails are usually identified immediately as spam and land in the junk folder of individual e-mail accounts, where they are promptly deleted. Additionally, the message is not tailored to appeal to a specific potential customer. The message is crafted to appeal to the population as a whole, where it does not have the influence it might if it were tailored to specific individuals who had opted-in to receive it. Finally, as in all marketing considerations, there is a considerable cost associated with mass communication. Companies need to minimize their costs, but how to do so is one of the biggest concerns.

Another important concern with using mass e-mails and other forms of large-scale advertisement are the legalities and ethical considerations. Just as in telemarketing, where is the line drawn between legal and illegal marketing procedures? Are companies allowed to force e-mail to potential customers or do permanent “opt-out” lists similar to phone company black lists need to be kept by ISPs and e-mail service providers? The United States attempted to address these considerations with the passing of the CAN-SPAM Act of 2003.⁶⁰

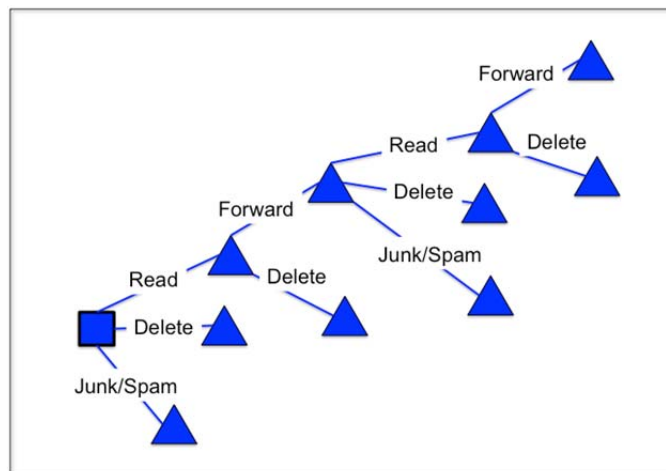
Corporations use e-mail to market goods and services as follows: They first send an e-mail to a specific number of individuals who will read the e-mail. This first e-mail is called a “seeding” e-mail, as it contains the initial message. It often includes an incentive such as free products, or cash rewards. This is where the expense for advertising begins to escalate. And the question remains, how many of these seed e-mails will a company need to send out, and how much will the associated incentives cost per e-mail? The seeded message then directs the initial recipient to forward that e-mail to those who he or she feels would like

⁶⁰ United States Congress, “Controlling the Assault of Non-Solicited Pornography and Marketing Act of 2003,” (Washington D.C.: 2003), accessed 19 November 2012, <http://uscode.house.gov/download/pls/15C103.txt>

the product, preferably all the e-mail contacts of that individual. This idea of returning favors is known as reciprocity, one of Robert Cialdini's six principles of persuasion.⁶¹

The beauty of using this method is that it takes advantage of dynamic targeting. Dynamic targeting is the opposite of mass leaflet drops or spam e-mails. It is not necessary to saturate the entire market with e-mails that simply get deleted. The target audience is selected from a much larger population. This means the number of initial, seeded e-mails can be smaller, and therefore incur fewer costs.

This specially crafted e-mail is then forwarded to potential customers from someone who is known by the subsequent recipient. An e-mail that is received from a friend, colleague, or acquaintance is far less likely to be deleted, and more likely to be opened and read. Figure 7 displays the initial decision tree associated with propagating e-mails.

Figure 7. Decision Tree for Propagation of E-mail⁶²

61 Robert B. Cialdini, *Influence, The Psychology of Persuasion*, (Harper Collins Publishers: New York, NY, 2007) 17-56.

62 Based upon lecture notes from DA4410 and research conducted for this thesis.

This study will proceed with a number of facts and assumptions, and will be confined to the college student population in the country of Afghanistan.

Facts:

- There are 112,367 college students attending government or private colleges or universities within Afghanistan.
- 28.1% of the population in Afghanistan is literate⁶³
- 35.3% of online users in Afghanistan use Facebook.⁶⁴
- The online population of Afghanistan is approximately one million users.⁶⁵
- U.S. College students have an average of 180 e-mail contacts.^{66 67}
- 5.4% Click through/Forward rate⁶⁸ average for 2011 and 2012 e-mails.⁶⁹
- 19.9% Open rate for e-mails.⁷⁰
- 19% of sent/forwarded e-mail will not be delivered, 7% automatically goes to junk/spam folders, and 12% is simply not delivered.⁷¹

63 Central Intelligence Agency, "Afghanistan." *The World Factbook*, 15 September 2012, accessed 24 October 2012, <https://www.cia.gov/library/publications/the-world-factbook/geos/af.html>.

64 *Social Bakers*, "Afghanistan Facebook Statistics," accessed 29 October 2012, <http://www.socialbakers.com/facebook-statistics/Afghanistan>.

65 Derived from statistics on <http://www.socialbakers.com/facebook-statistics/afghanistan>

66 Hsi-Pen Lu, Hsin-Chiau Fu, and Chia-Hui Yen, "A Study of E-Mail Marketing: Why Do People Read and Forward E-mail?" in *Advances in Information Systems Development New Methods and Practice for the Networked Society* (Springer Science and Business Media: Budapest, 2007) 239-248.

67 This statistic might be less for Afghanistan, however no numbers could be found, therefore the numbers for U.S. students will be used for the purpose of the model.

68 Click through rate is the rate at which e-mail or social media posts are forwarded. For this paper, 5.4% of e-mails received are forwarded.

69 Gavin O'Malley, "E-mail: Open Rates Down, CTR Trend Up," *Online Media Daily*, 23 July 2012 (Media Post News: July 2012) accessed 6 November 2012, <http://www.mediapost.com/publications/article/179347/e-mail-open-rates-down-ctr-trend-up.html>.

70 O'Malley, "E-mail: Open Rates Down, CTR Trend Up."

71 *Return Path*, "The Global E-mail Deliverability Benchmark Report, 1H 2011," accessed 6 November 2012, <http://landing.returnpath.com/globaldeliverability2h11>, 4.

- 91% of college students have a Facebook account and are active users.⁷²
- On average, each person on Facebook has 229 friends.⁷³
- Personal Facebook “News” will only reach 12% of total “Friends”⁷⁴
- Business related Facebook posts reach 16% of “Fans”
- Facebook has a click through rate (CTR) of 1.21% for Shares or Reposts⁷⁵

Assumptions:

- Each person has one e-mail address.
- Every “student” is online and utilizes e-mail.
- Opened e-mail will constitute a read e-mail.
- All online users are literate.

One thing to note about all of the facts and assumptions used in these distribution models is that the statistics regarding forwarding and open rates are for marketing research not for everyday use. A review of the literature found no studies that showed open rates or click through rates for all e-mails sent or all Facebook posts.

In this study, we looked at e-mail and Facebook distribution of a message about a hypothetical threat or disaster sent out to all students in the Afghan university and college system under three circumstances or scenarios. First is

72 Rachel King, “Nearly Half of College Students Prefer Internet to Friends,” *Between the Lines*, 21 September 2011, accessed 29 October 2012, <http://www.zdnet.com/blog/btl/nearly-half-of-college-students-prefer-Internet-to-friends-dating-study/58527>.

73 Sara Kehaulani Goo, “Facebook: A Profile of its ‘Friends,’” *Pew Research Center Publications*, 16 May 2012, accessed 29 October 2012, <http://pewresearch.org/pubs/2262/facebook-ipo-friends-profile-social-networking-habits-privacy-online-behavior>.

74 Josh Constine, “Your Average Facebook Post Only Reaches 12% Of Your Friends,” *TechCrunch*, 29 February 2012, accessed 15 November 2012, <http://techcrunch.com/2012/02/29/facebook-post-reach-16-friends/>.

75 David Kirkpatrick, “Social Sharing: Twitter Has Highest Amplification Rate, E-mail Has Highest Conversion Rate,” *Marketing Sherpa.com*, 23 March 2012, accessed 25 October 2012, <http://sherpablog.marketingsherpa.com/social-networking-evangelism-community/social-sharing/>

under ideal or perfect conditions, sending one e-mail to the entire population and maximizing the number of forwards of that e-mail and shares on Facebook. This section will also look at sending directed e-mails to a smaller population to see which distribution method is more efficient. The second scenario uses degrees of separation in social networking with the above stated assumptions. The third scenario is based upon the Bass Diffusion Marketing model.

A. IDEAL CONDITIONS

The first scenario assumes that all 112,367 students receive the e-mail, that 5.4% are going to forward the e-mail, and that all have an average of 180 contacts in their address book.⁷⁶ Based upon e-mail data studied over several years, we also take into account that only 81% of e-mails sent will reach their destination. This 19% failure rate occurs at every time period. At time period one, an e-mail is sent to each of the 112,367 college students in Afghanistan informing them of a threat or disaster. They are instructed to forward this e-mail to every one of their e-mail contacts. At time period two, the e-mail reaches 716,597 of which another 5.4% forward it to all of their contacts. At time period three, 5,641,913 people should be reached. By the 4th time period, a total of 44,419,908 people will have been reached. Note that by time period 3, the entire online population of Afghanistan will have been reached. As noted above, this assumes each person has only one e-mail account. It also assumes that all contact lists are disjoint (hence nobody receives the message more than once), that the online population in Afghanistan is within two degrees of separation from the students, and that all recipients do as instructed and forward the e-mails to all of their contacts. See Figure 8 for a graph of these time periods. We acknowledge that this ideal scenario is unrealistic; however we felt it needed to be shown as a baseline for the potential of how fast e-mail could spread even when concepts like failed delivery are accounted for.

⁷⁶ Hsi-Pen Lu, Hsin-Chiau Fu, and Chia-Hui Yen, "A Study of E-Mail Marketing: Why Do People Read and Forward E-mail?," 239-248.

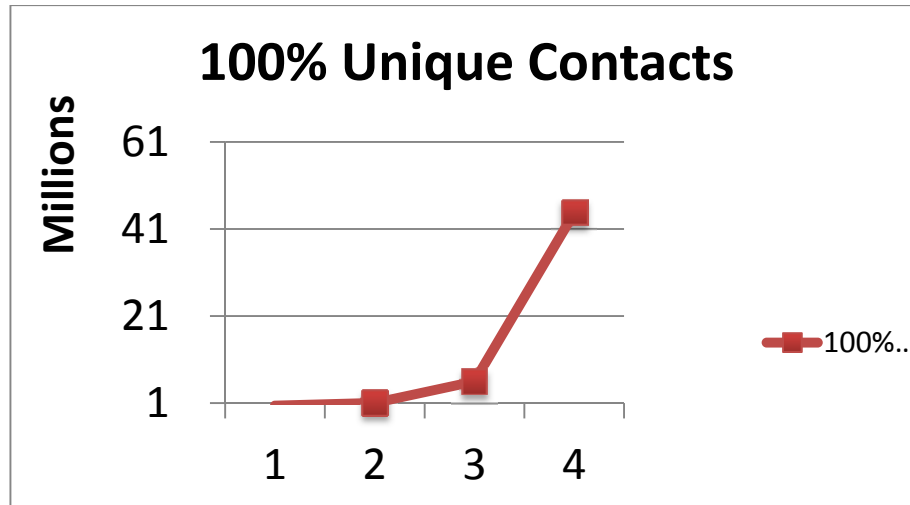


Figure 8. Maximize E-mail Receipt w/ No Constraints

Table 3 takes into account the possibility that students within our network share e-mail contacts. While there is no research that supports shared or mutual contact percentages, we can run the same formula for different percentages to show the maximum distribution that would be found. Compared to the 100% unique contacts we ran the numbers at 75%, 50%, 25% and 20% mutual contacts. Translated, this means that if one shares 75% mutual contacts with a friend, only 25% of their contact list is unique.

Time Period	100% Unique Contacts	A. 75% Mutual Contacts	B. 50% Mutual Contacts	C. 25% Mutual Contacts	D. 20% Mutual Contacts
1	91,017	91,017	91,017	91,017	91,017
2	716,597	179,149	358,299	537,448	573,278
3	5,641,913	352,620	1,410,478	3,173,576	3,610,824
4	44,419,908	694,061	5,552,489	18,739,649	22,742,993
5	349,726,821	1,366,120	21,857,926	110,655,752	143,248,106
6	2,753,469,207	2,688,935	86,045,913	653,411,150	902,256,790
7	21,678,613,763	5,292,630	338,728,340	3,858,327,498	5,682,918,526
8	170,680,061,879	10,417,484	1,333,437,983	22,783,038,045	35,794,203,313

Table 3. Maximized E-mail Distribution w/ Possible %s of Contacts

Looking at Table 3, Column A shows that with only a quarter of contacts unique, it is possible to reach the entire online population of Afghanistan in just under five time periods. This amount of mutual contacts is consistent with a smaller network like a university population where the majority of contacts will be shared. Compare this to Column D where the shared contact percentage is 20%. The potential reach after 7 time periods is more than the population of the entire world. We understand that this is far greater than the current online population of about 2.2 billion, but it shows the potential for large distribution when taking into account undelivered and forwarded e-mails.⁷⁷

In addition to the large mass e-mail model we also ran numbers for small seed e-mails (see Figure 9). Like the initial model, this chart does not factor in mutual contacts; it only shows the potential distribution numbers in a smaller context. With an initial seed e-mail to only 25 individuals, we have the potential to reach our target population in approximately 5 time periods. The figure shows how fast we could reach our TA's population under ideal conditions.

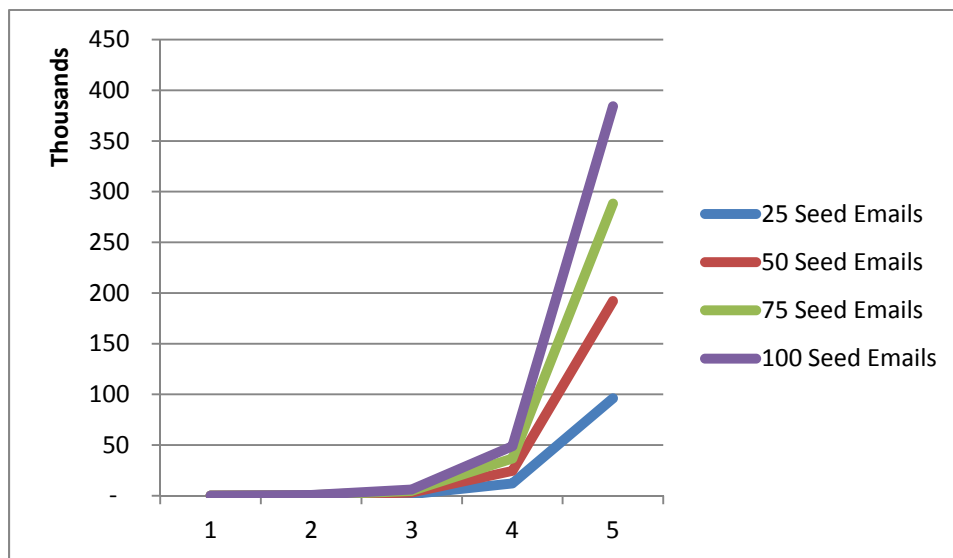


Figure 9. Baseline E-mail Distribution

⁷⁷ Another variable that is not factored into these distributions is that as time goes on and the e-mails are forwarded, the pool of potential contacts will shrink with each iteration of sent e-mails. While the numbers will still grow, they will not grow as fast as shown in this table.

Switching mediums, we will now look at the distribution patterns of Facebook. There are some shared traits with the e-mail distribution model. Once again, there is nothing in the body of knowledge showing the average number of mutual contacts; however unlike e-mail, Facebook does have research showing the potential reach of a news feed post compared to the maximum potential “Friend” linkages within a network.

Looking at the Facebook portion of this first scenario, the original Facebook post starts at 102,254 posts, assuming that 91% of the students have a Facebook page and that each has an average of 229 friends.^{78,79} The formula used to generate read posts is as follows:

$$\text{\# New Posts} = (\text{\# Previous Period}) * (\text{Friends}) * \text{CTR} * (\text{Potential Reach})^{80}$$

At Time Period Two, the new posts or shares drop to 34,000.⁸¹ In theory, taking the cumulative posts read, we see that only 153,191 posts will be read off of that initial seed post to the Afghan student population. Added to this graph is a line denoting the student population in Afghanistan for reference purposes.

78 Johan Ugander, “The Anatomy of the Facebook Social Graph,” (Facebook, Cornell and the University of Michigan, 18 November 2011) accessed 7 September 2012, <http://arxiv.org/pdf/1111.4503v1.pdf>.

79 Rachel King, “Nearly Half of College Students Prefer Internet to Friends.”

80 All facts for this formula can be found at the top of the chapter in the bulleted list. CTR = Click Through Rate (Forward). As opposed to e-mail, Facebook as a CTR or 1.21%. For potential reach, we used 12%. Facebook calculates that 12% of a users friendship ties will see a post. See Notes 16 and 17.

81 See Figure 9.

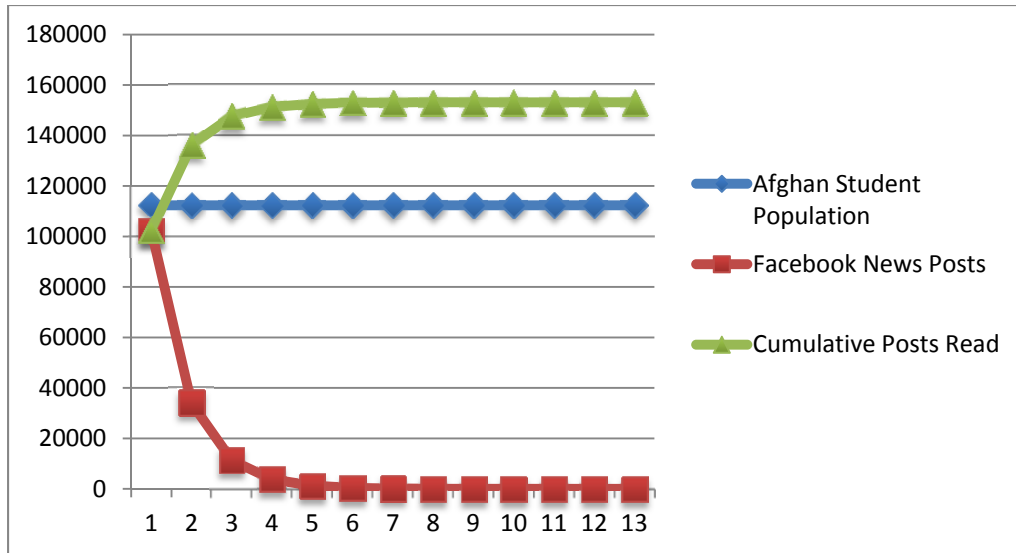


Figure 10. Maximize Facebook Receipt (News Feed)

The next figure is a slight variation of the previous Facebook scenario.⁸² According to Facebook, an average “Fan” page will reach 16% of its total fans. Using this percentage on the first iteration, we see that our cumulative posts read increases to approximately 170,000 reads.⁸³

⁸² See Figure 10.

⁸³ We only changed the first iterations reach percentage because after that iteration the post now becomes a normal “news feed” post on any Facebook users profile or Timeline page.

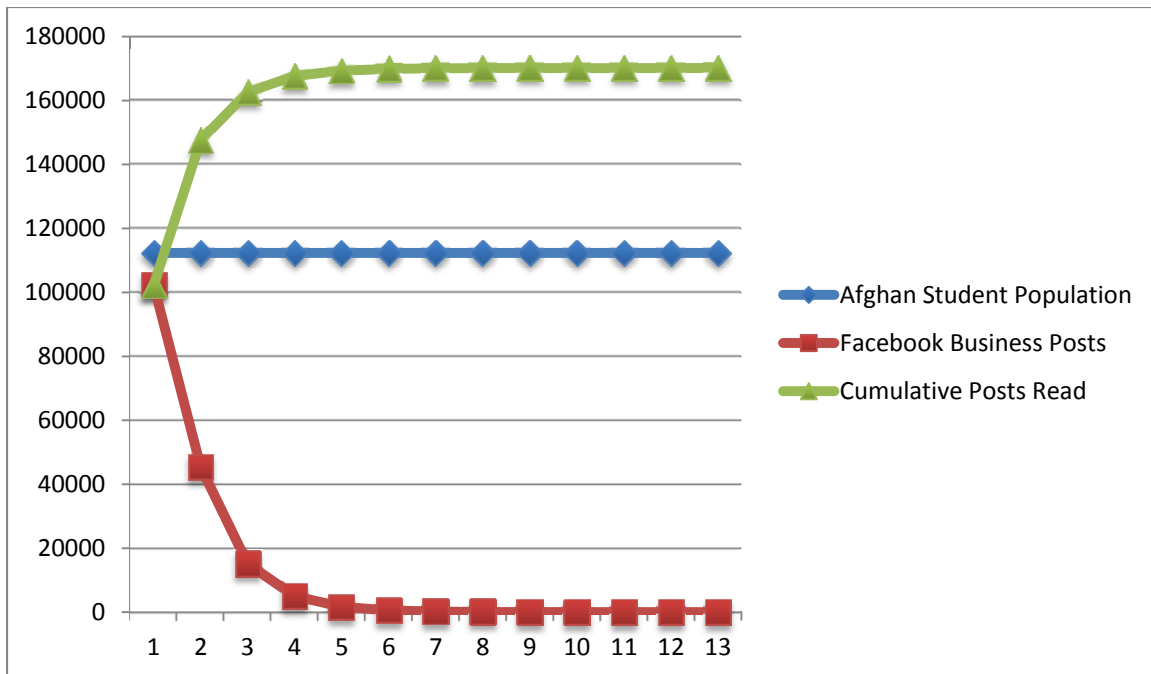


Figure 11. Maximize Facebook Receipt (Fan Page)

These two models resulted in different results. The e-mail distributions continue on with the potential to reach the entire online population very quickly under ideal conditions. Even though we do not see it on our figures, eventually the increase will level off and come back down as the graph reaches the end of the online population. Facebook distributions, however, take a different path. One generated post initially seen by 91% of our target audience only results in about 150,000 people seeing the message due to the fact that as the information is reposted, fewer and fewer “Friends” see the post. Eventually the post will die. However, there is the chance that it could be reposted at a later date, reinvigorating the posting chain.

B. DEGREES OF SEPARATION

One area of network theory that was hinted at in the previous section, but not explained, is the idea of degrees of separation. There are different theories behind this concept. Most pop culture enthusiasts associate degrees of separation with “Six Degrees of Kevin Bacon,” the idea that anyone celebrity is

only six degrees (or people) away from the actor, Kevin Bacon.⁸⁴ The original idea was from a short story, “Lancszemek” written in 1929 by Hungarian author, Frigyes Karinthy. This short story is believed to have contained the first published record of the concept now known as “six degrees of separation.”⁸⁵

Stanley Milgram revisited this concept in 1967 while conducting a study to determine the “distance” between two individuals in the United States. His experiment consisted of sending letters from individuals in Wichita, Kansas and Omaha Nebraska to specific individuals in Massachusetts, one the wife of a divinity student in Sharon, and the other a stockbroker in Boston. The letter had a set of instructions directing people what to do with the letter when they received it. If they were a first name acquaintance of the target, then they were to directly deliver the letter to the target. If they did not know the target, they were to mail the letter to an acquaintance that had a better chance of knowing the target. Milgram started with 160 seed letters. Of these initial letters, 42 made it to the targets. Of the letters that made it to their target, Milgram found they showed a median of 5.5 degrees of separation between the originator and target, very close to Karinthy’s concept. The actual term “six degrees of separation” was actually coined by John Guare as the title of a play he wrote in 1991. In this play, the main character, Ousa states,

Everybody on this planet is separated by only six other people. Six degrees of separation. Between us and everybody else on this planet. The president of the United States. A gondolier in Venice... It’s not just the big names. It’s anyone. A native in a rain forest. A Tierra del Fuegan. An Eskimo. I am bound to everyone on this planet by a trail of six people. It’s a profound thought....How every person is a new door opening up into other worlds.⁸⁶

84 The idea behind “six degrees of Kevin Bacon” was a result from a claim by the actor that he had worked with everyone in Hollywood. Several college students started playing the game at parties in the 1990s guessing if they could connect any celebrity with Kevin Bacon. Google has added it as a function on their search engine. By typing “bacon number” and then a celebrity’s name, Google will show what their “Bacon” number results are.

85 Albert-László Barabási, *Linked*, (New York, NY: Penguin Group, 2003) 25-29.

86 Barabási, *Linked*, 29.

In research, conducted in 2011 and published at the beginning of 2012, researchers at Facebook examined the entire Facebook network to measure the degree of separation between every pair of users. They found that the average distance between two individuals was 4.74, however, this translates to an average 3.74 degrees of separation between any two individuals on Facebook.⁸⁷

If the theory behind degrees of separation holds true, an organization could essentially reach out to anyone around the globe with their product or information they are trying to spread. However, with this type of scenario, the initiator is trusting that the content or product is good enough that recipients want to forward it along. One major issue with this theory is that it is inefficient in regards to utilizing cyber methods. The human variable will inevitably slow down the process. Even with Milgram's experiment, only 26% of the original letters ever made it to their destination targets. If you are utilizing e-mail, one must factor in undelivered e-mail on top of this low percentage of messages that might reach their destination.

C. BASS DIFFUSION MODEL

The third scenario is based upon the Bass Diffusion model. The Bass diffusion model was developed by Frank Bass in the 1960s. This model describes the process of how new products are adopted. It looks at the interactions between users and potential users. This model is widely used in product and technology forecasting.⁸⁸ Marketing agencies utilize the Bass Diffusion model to show potential buyers how much product has to be sold in order to reach whatever goal they desire. For the purpose of this model, we are utilizing 112,367 Afghan college students as our target audience. The figure below shows that the most e-mails generated in any single time period is just above 20,000. When compared to our baseline figures above, this model seems

⁸⁷ Lars Backstrom et al., "Four Degrees" *Facebook* (5 January 2012), accessed 15 November 2012, <http://arxiv.org/abs/1111.4570v3>.

⁸⁸ Frank Bass, "A new product growth model for consumer durables," *Management Science* No. 15, 1969, p215–227.

realistic. This model simulates the fact that, just like reality, in a closed network, contact lists are mutual entities. In theory the number of e-mails generated could continue on an upward trend, but in practice the number reaching new users peaks at a certain point and then falls back to zero.

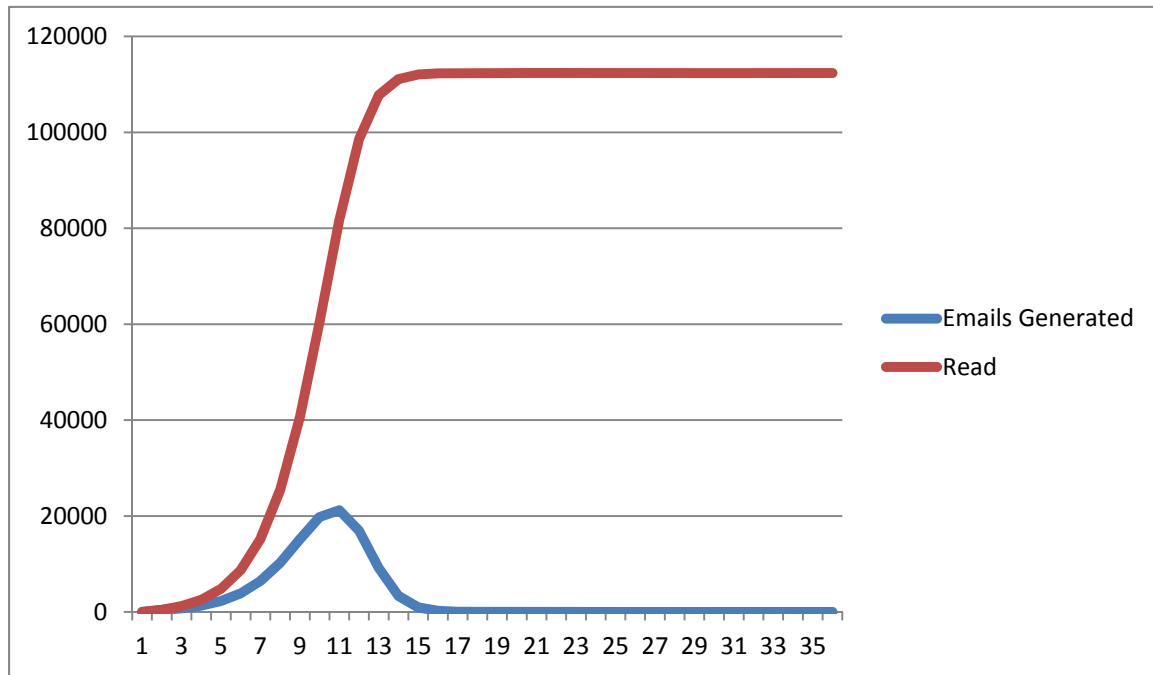


Figure 12. Bass Diffusion Model⁸⁹

D. DISTRIBUTION MODELING CONCLUSIONS

In the event of a crisis, the most easily reached and influenced population within the cyber domain are those belonging to the 18–35 year old age group. If the military or a Federal agency could leverage this population to receive messages and then forward the messages on either by word of mouth, or further cyber means, a large portion of the population could be reached. The majority of schools can send out an e-mail blast to all members of their respective

⁸⁹ All Figures were derived originally for a project in DA4410, Models of Conflict

domain. For example at the Naval Postgraduate School there are 3,159 students. ITACs can send out one e-mail that goes to all students with a @nps.edu address.

Taking into account the assumptions made for the scenarios described above, it is apparent that electronic mail and social media sites such as Facebook can have an exponential impact on the marketing or messaging impact of an organization. What cannot be calculated or gleaned from these scenarios is what causes these messages or posts to be forwarded. As stated above, the information that causes a viral message or electronic mail is unknown. A third thing that needs to be understood is that some of these scenarios assumed that contacts and “Friends” were unique.⁹⁰ In reality, contact lists or “Friends” lists are not unique. We attempted to mitigate this uniqueness issue by factoring in Facebook’s “potential reach” for news feeds during our calculations. Even after taking into account variables such as potential reach, forwarding rate and undelivered e-mails, we still see that we have the potential to reach a large target audience with either e-mails or social media posts. The cost of writing an e-mail or placing a post on a social media site has almost unlimited potential when compared to the cost of traditional means of communication that the military is utilizing in today’s conflicts.

90 Unique for the context of this paper is understood to mean that if Alice and Bob each have contact or Friends Lists on Facebook, those contacts or Friends are considered unique if they are not shared with each other.

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V. CONCLUSION

A. REVISITING THE OBJECTIVE

In this research, we looked at the use of cyberspace, specifically the Internet, to conduct Inform and Influence operations. Through the acceptable use of webpage advertising, e-mail campaigns, and the use of social media, a message could be propagated through cyberspace to influence a target audience in order to change a behavior or simply to inform that target audience about something. This work demonstrated the successful use of cyber to inform and influence in conjunction with other information operations tools.⁹¹ Based on the analysis of material in the previous chapters, the following section provides a summary of how cyber messaging can be applied to an integrated IO campaign.

B. RECOMMENDATIONS

The military's efforts to operationalize cyber as an inform and influence activity has caused cyber planning efforts to be extremely slow and in most cases over-classified. To date the military use of cyber as an inform tool has mainly been in the social network arena such as Facebook and Twitter. As discussed in Chapter III, employing cyber delivery methods could reduce the cost of current MISO delivery methods such as radio, television, handbills, leaflets, or billboards.

As of this writing, there is no published Joint or Army doctrine for cyberspace operations. Furthermore, the current MISO and Information Operations doctrine does not address the use of cyber platforms such as webpages, e-mail, or social networks as a viable tool from which to conduct influence or inform tasks. Informal Tactics, Techniques, and Procedures (TTPs) do allow for the use of social networks to convey public affairs information and command information, both directed mainly at U.S. audiences, but in looking at

⁹¹ This work primarily focuses on inform techniques as many of the influence techniques are part of classified programs.

Dr. Dana Janbek's work on terrorist's use of the Internet, and the ability of terrorist groups and individuals to send a message to recruit, train, or organize people to support a cause, the U.S. Government is way behind.⁹² Developing TTPs or Doctrine that will allow the military to use open-source tools to design and deliver a message to a specific target audience will result in a more responsive IO program that will meet the needs of future commanders.

C. DESIGNING A MESSAGE AND UNDERSTANDING THE NETWORK

The MISO community currently has a very robust ten-step process in order to identify a target audience and begin to develop a message that will resonate with a specific target audience. According to FM 3-05.301 the target audience analysis process seeks to answer four basic questions:

- What TAs [Target Audience] will be most effective in accomplishing the desired behavioral or attitudinal response?
- What lines of persuasion will influence the TA to achieve the objective?
- What media will effectively carry the chosen line of persuasion?
- What events will indicate success or failure of the PSYOP effort?⁹³

As part of the ten-step process and to answer the above four questions, we must understand how and where to deliver a message. If the plan is to develop new content and on a new webpage that is linked to others, then we need a clear understanding of how people will get to the webpage and a complete understanding of the content that is hosted on the new and refereeing webpage. Using Dr. Janbek's six-step process in conjunction with the Army ten-step TAA process, will assist in designing a message that blends with its surroundings and should reach the intended target audience.⁹⁴

92 Dana M. Janbek, "What We Can Learn From jihadist websites- A Content Analysis." (Lecture, Naval Postgraduate School, Monterey, CA, 19–20 June 2012)

93 Department of the Army, *Psychological Operations Tactics, Techniques, and Procedures*, Field Manual 3-05.301, 5-1.

94 Philip Seib and Dana M. Janbek, *Global Terrorism and New Media: The post-Al Qaeda generation*, (New York, NY: Routledge, 2011) 45.

As technology evolves and understanding of the Internet topology grows, we can use simple techniques such as geolocation to deliver content directly to a specific area or even user. By using open-source techniques such as wardriving, ping sweeps, or trace routes, we can begin to identify domains and work with current geolocation data to layout the topology of a given network. Understanding the domain structure and geo-referenced topology of a network allows us to design content and delivery methods that will cater to a specific target audience.

D. CONTENT DELIVERY

If the target audience is known and we understand their online behaviors, then a messaging strategy that fits the needs of the target can be designed. We looked at three specific delivery methods; webpage advertising, e-mail, and social networks. Using techniques such as domain mapping and geolocation, webpage advertising could be very effective. Geo-referenced banner ads on webpages in conjunction with dynamic webpages could deliver ads that cater to specific domains and browser settings, ensuring that a specific message is delivered to a specific area in the correct language. Unlike a leaflet drop that may land in the wrong neighborhood, have the wrong language printed on it, and then be picked up by someone who cannot even read, online content can be tailored by location and language.

E-mail, although harder to target a specific audience, if linked to webpage banner ads as part of an opt-in messaging strategy, could be used to convey a very specific message to an influential group.

Social networks are the fastest growing sites on the Internet, with Facebook alone growing from 1 million users in December 2004 to 1.01 billion users in September 2012.⁹⁵ With the average person having 230 friends, the

⁹⁵ Associated Press, "Number of active users at Facebook over the years," *The Associated Press*, 23 October 2012, accessed 16 November 2012, <http://finance.yahoo.com/news/number-active-users-facebook-over-years-214600186--finance.html>

ability to reach a large specific target audience is becoming easier. Metrics from just one Facebook site, <https://www.facebook.com/CallDibsApp>, shows that even with only 487 fans, there is a potential to reach over 159,000 people through either direct likes or mutual friends.⁹⁶

E. MEASURES OF EFFECTIVENESS

The ability to collect and analyze metrics for webpages, e-mail, or social networking is much easier than for any current MISO delivery platform. When using a MISO delivery platform such as a leaflet drop, it is very easy to report your Measure of Performance, for example, that ten thousand leaflets were dropped from the aircraft. The question that is very hard to answer is, of the ten thousand leaflets, how many were picked up and read by someone, and of those that were picked up, how many influenced the reader to do the desired action? To further this line of thought would be to ask how many of these leaflets were picked up and then shared with a collective audience? Now if we were to take the same message and put it in on a webpage banner ad, and that banner ad is delivered to anybody that is accessing that website from the local university domain, we are able to track how many people see the banner ad, how many click on it, and if the banner ad is tied to something such as an opt-in e-mail campaign, how many were influenced to sign up for the opt-in e-mail delivery. The data that is gathered by online analytic suites, although not perfect, will deliver a much better metric that can be reported back to the command. Similar metrics can be gathered from e-mail and social network messaging campaigns.

F. POTENTIAL REACH

The potential reach of cyber delivery methods at first glance seems unlimited or has the potential to be unlimited. Once the background research or analysis has been conducted on a target audience, the distribution method is the easy part. The models that were used had to take into account certain

⁹⁶ Facebook, "CallDibsApp" accessed 15 October 2012, <https://www.facebook.com/CallDibsApp>.

assumptions such as uniqueness of contacts or friends. These assumptions, in some cases, caused calculations to sky rocket exponentially in ways that do not match reality. However, as more and more individuals navigate the Internet, the overall reach of e-mail and social media has the potential to grow exponentially. In the last twelve years, Africa has seen a growth of 3600% in their Internet users. Twelve years ago approximately 361 Million people had an online presence. Today, there are 2.4 billion people online. This represents a 566% increase in just over a decade. With the trending reliance on smart phones and mobile devices, the reach of the Internet and cyber delivery methods almost is limitless.⁹⁷

G. SUGGESTIONS FOR FUTURE RESEARCH

The following is a list of potential future research based on this paper:

- Develop IO / Cyber / MISO doctrine based on the best practices identified in this thesis.
- Research and test specific domain and dynamic webpage content delivery methods.
- Research the specific distribution of a message across social networks (Facebook, Twitter, My Space etc.)

⁹⁷ Internet World Statistics, "Internet Usage Statistics," accessed 17 November 2012, <http://www.internetworldstats.com/stats.htm>.

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GLOSSARY

Cyber—A combining form meaning “computer,” “computer network,” or “virtual reality,” used in the formation of compound words (cybertalk; cyberart; cyberspace) and by extension meaning “very modern” (cyberfashion).⁹⁸

Cyberspace—A global domain within the information environment consisting of the interdependent network of information technology infrastructures, including the Internet, telecommunications networks, computer systems, and embedded processors and controllers.⁹⁹

Cyberspace Operations—The employment of cyberspace capabilities where the primary purpose is to achieve objectives in or through cyberspace.¹⁰⁰

Information Operations (IO)—The integrated employment of the core capabilities of electronic warfare (EW), computer network operations (CNO), PSYOP, military deception (MILDEC), and operations security (OPSEC), in concert with supporting and related capabilities to influence, disrupt, corrupt, or usurp adversarial human and automated decision making while protecting our own.¹⁰¹

Psychological Operations (PSYOP)—Planned operations to convey selected information and indicators to foreign audiences to influence their emotions,

⁹⁸ Cyber. (n.d.). *Dictionary.com Unabridged*, accessed 10 July 2012, <http://dictionary.reference.com/browse/Cyber>

⁹⁹ Department of Defense, *Deputy Secretary of Defense Memorandum*, 12 May 2008 (Washington, D.C.: GPO, 2008), accessed 30 October 2012, http://www.dtic.mil/doctrine/dod_dictionary/data/c/10160.html.

¹⁰⁰ Department of Defense, *Joint Operations*, Joint Publication 3–0, 11 August 2011 (Washington D.C.: GPO, 2011) GL-8.

¹⁰¹ Department of Defense, *Joint Information Operations*, Joint Publication 3–13, 13 February 2006 (Washington D.C.: GPO, 2006) I-1.

motives, objective reasoning, and ultimately the behavior of foreign governments, organizations, groups, and individuals. The purpose of psychological operations is to induce or reinforce foreign attitudes and behavior favorable to the originator's objectives. Also called MISO.^{102,103}

Public Affairs (PA)—Those public information, command information, and community engagement activities directed toward both the external and internal publics with interest in the Department of Defense. Also called PA.¹⁰⁴

Measure of Effectiveness (MOE)—A criterion used to assess changes in system behavior, capability, or operational environment that is tied to measuring the attainment of an end state, achievement of an objective, or creation of an effect. Also called MOE.¹⁰⁵

Target Audience (TA)—An individual or group selected for influence. Also called TA. (JP 1–02. SOURCE: JP 3–13) For the purpose of this paper we will also use TA to describe those individuals or groups selected for inform activities.¹⁰⁶

¹⁰² Department of Defense, *Psychological Operations*, Joint Publication 3–13.2, 7 January 2010, (Washington D.C.: GPO, 2010) GL-8.

¹⁰³ Since late 2010, the Department of Defense has changed the term PSYOP to Military Information Support Operations (MISO.) The two terms currently can be interchanged to mean the same thing. Department of Defense members have been instructed to use the term MISO instead of PSYOP, however the definitions have not yet been updated within DoD publications.

¹⁰⁴ Department of Defense, *Public Affairs*, Joint Publication 3–61, 25 August 2011 (Washington D.C.: GPO, 2010) GL-6.

¹⁰⁵ Department of Defense, *Joint Operations*, Joint Publication 3–0, 11 August 2011 (Washington D.C.: GPO, 2011) GL-13.

¹⁰⁶ Department of Defense, *Joint Information Operations*, Joint Publication 3–13, 13 February 2006 (Washington D.C.: GPO, 2006)

In marketing and advertising, a target audience, or target group is the primary group of people that something is aimed at appealing to. A target audience can be people of a certain age group, gender, marital status, etc.¹⁰⁷

Strategic Communication (SC)—Focused United States Government efforts to understand and engage key audiences to create, strengthen, or preserve conditions favorable for the advancement of United States Government interests, policies, and objectives through the use of coordinated programs, plans, themes, messages, and products synchronized with the actions of all instruments of national power.¹⁰⁸

Inform and Influence Activities (IIA)—Inform and Influence Activities is the integration of designated information-related capabilities in order to synchronize themes, messages and actions with operations to inform U.S. and global audiences, influence foreign audiences and affect adversary and enemy decision-making.¹⁰⁹

Military Deception (MILDEC)—Actions executed to deliberately mislead adversary military decision makers as to friendly military capabilities, intentions, and operations, thereby causing the adversary to take specific actions (or inactions) that will contribute to the accomplishment of the friendly mission. Also called MILDEC.¹¹⁰

¹⁰⁷ Target Audience, *Wikipedia*, accessed 10 October 2012, http://en.wikipedia.org/wiki/Target_audience.

¹⁰⁸ Department of Defense, *Joint Operation Planning*, Joint Publication 5–0, 11 August 2011, (Washington D.C.: GPO, 2011) II-9.

¹⁰⁹ U.S. Army Information Proponent Office, *Instructor's Guide to Inform and Influence Activities*, (Fort Leavenworth, KS: USAIPO, 2011), accessed 30 October 2011, <http://www.carlisle.army.mil/dime/getDoc.cfm?fileID=454>, 4.

¹¹⁰ Department of Defense, *Military Deception*, Joint Publication 3.13.4, 13 July 2006, (Washington D.C.: GPO, 2006) I-1.

While this list is not entirely inclusive of all of the terms used in this thesis, it does include a majority of the terms that are being debated today. We acknowledge that these terms may have changed since writing this document, however these were the approved definitions at the time.

LIST OF REFERENCES

- Backstrom, Lars, Paolo Boldi, Marco Rosa, John Ugander, and Sebastiano Vigna. "Four Degrees." *Facebook*, 5 January 2012. Accessed 15 November 2012. <http://arxiv.org/abs/1111.4570v3>.
- Barabási, Albert-László. *Linked*. New York, NY: Penguin Group, 2003.
- Bass, Frank. "A new product growth model for consumer durables," *Management Science* 15 (1969): 215–227.
- Booth, Daniel and Bernard Jansen. "A Review of Methodologies for Analyzing websites." In *Handbook of Research on Web Log Analysis*, edited by Bernard J. Jansen, Amanda Spink and Isak Taksa, 1–76. Hershey, NY: IGI Global, 2009.
- Bosker, Bianca. "Facebook Explains How Often Your Posts Actually Get Seen." *The Huffington Post*, 29 February 2012. Accessed 14 November 2012. http://www.huffingtonpost.com/2012/02/29/facebook-posts_n_1311330.html.
- Central Intelligence Agency. "Afghanistan." *The World Factbook*, 15 September 2012. Accessed 24 October 2012. <https://www.cia.gov/library/publications/the-world-factbook/geos/af.html>.
- Cialdini, Robert B. *Influence, The Psychology of Persuasion*. New York: Harper Collins Publishers, 2007.
- Constine, Josh. "Your Average Facebook Post Only Reaches 12% Of Your Friends," *TechCrunch*, 29 February 2012, accessed 15 November 2012, <http://techcrunch.com/2012/02/29/facebook-post-reach-16-friends/>.
- Cyber. (n.d.). *Dictionary.com, Unabridged*. Accessed 10 July 2012. <http://dictionary.reference.com/browse/Cyber>
- Dahnert, Art. "Hawkeyes: An Advanced IP Geolocation Approach." Austin, TX: Overwatch Systems Ltd. Accessed 25 October 2012. <http://ieeexplore.ieee.org/stamp/stamp.jsp?Tp=&arnumber=5978788&isnumber=5978775>.
- Department of the Army. *Psychological Operations Tactics, Techniques, and Procedures*, Field Manual 3–05.301, December 2003. Washington D.C.: GPO, 2003.

- Department of the Army. *Psychological Operations Tactics, Techniques, and Procedures*, Field Manual 33–1–1, 05 May 1994. Washington D.C.: GPO, 1994.
- Department of Defense. *Deputy Secretary of Defense Memorandum*, 12 May 2008. Washington, D.C.: GPO, 2008. Accessed 30 October 2012.
http://www.dtic.mil/doctrine/dod_dictionary/data/c/10160.html.
- . *Joint Information Operations*, Joint Publication 3–13, 13 February 2006. Washington D.C.: GPO, 2006.
- . *Joint Operations*, Joint Publication 3–0, 11 August 2011. Washington D.C.: GPO, 2011.
- . *Joint Operation Planning*, Joint Publication 5–0, 11 August 2011. Washington D.C.: GPO, 2011.
- . *Military Deception*, Joint Publication 3.13.4, 13 July 2006. Washington D.C.: GPO, 2006.
- . *Psychological Operations*, Joint Publication 3–13.2, 7 January 2010. Washington D.C.: GPO, 2010.
- . *Public Affairs*, Joint Publication 3–61, 25 August 2011. Washington D.C.: GPO, 2010.
- Downey II, Gabriel R., David A. Hollis, and Harold D. Rouse. “You Have Been Friended By the U.S. Military: Using Social Networking Services for IO Messaging,” Master’s thesis, Naval Postgraduate School, 2010.
- Efaw, James and Christopher Heidiger. “Another Tool in the Influencer’s Toolbox.” *Global Ecco*. Accessed 24 October 2012.
<https://globalecco.org/97>.
- Eriksson, Brian, Paul Barford and Robert Nowak. “Estimating Hop Distance Between Arbitrary Host Pairs.” INFOCOM 2009 Proceedings, IEEE, 19–25 April 2009. 801–809.
- Facebook. “SETimes.” Accessed 1 October 2012.
<https://www.facebook.com/SETimes>.
- . “CallDibsApp.” Accessed 15 October 2012.
<https://www.facebook.com/CallDibsApp>.
- Fox, William. “DA4410: Models of Conflict.” Lecture, Naval Postgraduate School, Monterey, CA.

Flurry.com. Call Dibs Analytics. Accessed 5 November 2012.
<http://www.flurry.com>.

Gill, Phillipa, Yashar Ganjali, Bernard Wong, and David Lie. "Dude, where's that IP? Circumventing measurement-based IP geolocation." *Usenix Security Symposium*, August 2010. Accessed 25 October 2012.
http://www.usenix.org/events/sec10/tech/full_papers/Gill.pdf.

Goo, Sara K., "Facebook: A Profile of its 'Friends.'" *Pew Research Center Publications*, 16 May 2012. Accessed 29 October 2012.
<http://pewresearch.org/pubs/2262/facebook-ipo-friends-profile-social-networking-habits-privacy-online-behavior>.

Gueye, Bamba, Artur Ziviani, Mark Crovella, and Serge Fdida. "Constraint-Based Geolocation of Internet Hosts." *IEEE/ACM Transactions on Networking*, Vol.14, No.6, December 2006. Accessed 24 October 2012. http://www-rp.lip6.fr/site_npa/_publications/682-p1219-gueye.pdf.

Hamdard, Javid. "The State of Telecommunications and the Internet in Afghanistan Six Years Later (2006–2012)" *USAID Assessment Report*, March 2012. Afghanistan Media Development and Empowerment Project, 2012. Accessed 4 October 2012. <http://www.internews.org/research-publications/state-telecommunications-and-Internet-afghanistan-six-years-later-2006–2012>.

Hampton, Keith, Lauren Sessions Goulet, Cameron Marlow and Lee Rainie. "Why Most Facebook Users Get More Than They Give." *Pew Internet and American Life Project*, 3 February 2012. Accessed 24 October 2012.
<http://www.pewinternet.org/Reports/2012/Facebook-users/Part-3-The-Structure-of-Friendship.aspx?view=all>.

IP Lookup. Accessed 24 October 2012. <http://ip-lookup.net>.

Janbek, Dana M. "What We Can Learn From jihadist websites- A Content Analysis." *Lecture*, Naval Postgraduate School, Monterey, CA. 19–20 June 2012.

King, Rachel. "Nearly Half of College Students Prefer Internet to Friends." *Between the Lines*, 21 September 2011. Accessed 29 October 2012.
<http://www.zdnet.com/blog/btl/nearly-half-of-college-students-prefer-Internet-to-friends-dating-study/58527>.

- Kirkpatrick, David. "Social Sharing: Twitter Has Highest Amplification Rate, E-mail Has Highest Conversion Rate." *Marketing Sherpa.com*, 23 March 2012. Accessed 25 October 2012.
<http://sherpablog.marketingsherpa.com/social-networking-evangelism-community/social-sharing/>.
- Lu, Hsi-Pen, Hsin-Chiau Fu, and Chia-Hui Yen, "A Study of E-Mail Marketing: Why Do People Read and Forward E-mail?" in *Advances in Information Systems Development New Methods and Practice for the Networked Society*. Budapest: Springer Science and Business Media, 2007.
- Muirhead, John "The Mind as a Target: Psychological Operations and Data Fusion Technology." Air Intelligence Agency, 2001.
- Network Advertising Initiative. "Education Resources." Accessed 24 October 2012. <http://www.networkadvertising.org/consumer-education/education-resources>.
- Nutley, Michael. "How the Average Brand Behaves in Social Media." CMO.com, 25 June 2012. Accessed 16 November 2012. <http://m.cmo.com/social-media/how-average-brand-behaves-social-media>.
- O'Malley, Gavin. "E-mail: Open Rates Down, CTR Trend Up." *Online Media Daily*, 23 July 2012. Accessed 6 November 2012.
<http://www.mediapost.com/publications/article/179347/e-mail-open-rates-down-ctr-trend-up.html>.
- Prudens Consulting Limited, "Advertising On The Internet." *Benchmark Communications*. Accessed 24 October 2012.
http://www.bmcommunications.com/int_ad.htm.
- Return Path*. "The Global E-mail Deliverability Benchmark Report, 1H 2011." Accessed 6 November 2012.
<http://landing.returnpath.com/globaldeliverability2h11>.
- Seib, Philip and Dana M. Janbek. *Global Terrorism and New Media: The Post-Al Qaeda Generation*. New York, NY: Routledge, 2011.
- Social Bakers*. "Afghanistan Facebook Statistics." Accessed 29 October 2012.
<http://www.socialbakers.com/facebook-statistics/Afghanistan>.
- Target Audience. *Wikipedia*. Accessed 10 October 2012.
http://en.wikipedia.org/wiki/Target_audience.

- Ugander, Johan. "The Anatomy of the Facebook Social Graph." *Facebook*, Cornell and the University of Michigan, 18 November 2011. Accessed 7 September 2012, <http://arxiv.org/pdf/1111.4503v1.pdf>.
- U.S. Army Information Proponent Office. *Instructor's Guide to Inform and Influence Activities*. Fort Leavenworth, KS: USAIPO, 2011. Accessed 30 October 2011. <http://www.carlisle.army.mil/dime/getDoc.cfm?fileID=454>.
- Van der Lans, Ralf, et al., "A Viral Branching Model for Predicting the Spread of Electronic Word of Mouth" in *Marketing Science* Vol. 29, Issue 2, March 2010. Institute for Operations Research and the Management Sciences, Linthicum, MD.
- Wong, Bernard, Ivan Stoyanov, and Emin Gün Sirer. "Octant: A Comprehensive Framework for the Geolocalization of Internet Hosts." Symposium on Networked System Design and Implementation. Cambridge, MA, April 2007. Accessed 25 October 2012. <http://www.cs.cornell.edu/~bwong/octant/papers/>
- Youn, Inja, Brian L. Mark and Dana Richards. "Statistical Geolocation of Internet Hosts." Fairfax, VA: George Mason University, 2009. Accessed 24 October 2012. <http://napl.gmu.edu/pubs/CPapers/YounMarkRichards-ICCCN09.pdf>.

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